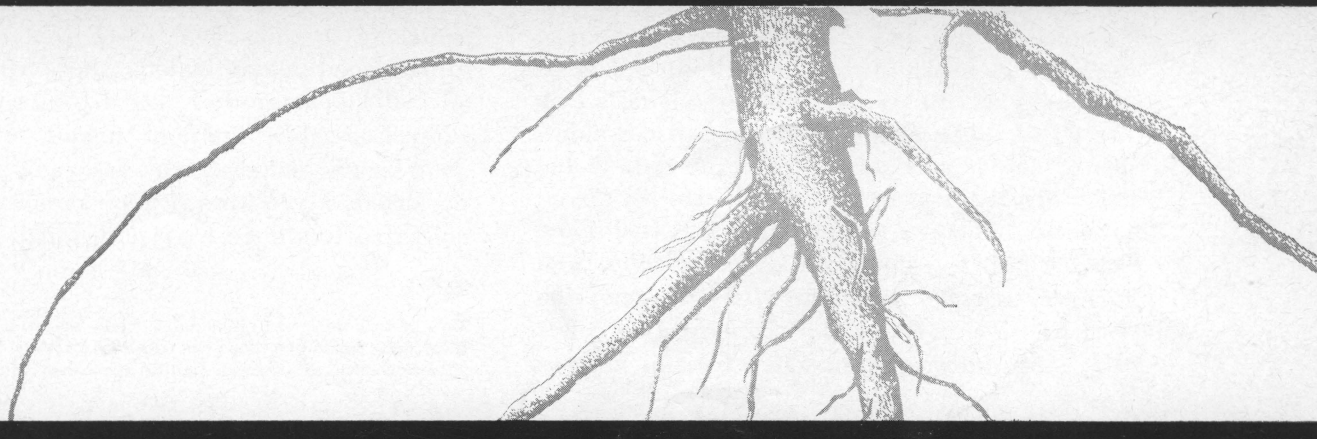
MP-361

ROOT ROT LOSSES of COTTON can be reduced



THE AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS | College Station, Texas
TEXAS AGRICULTURAL EXTENSION SERVICE | J. E. Hutchison, Director

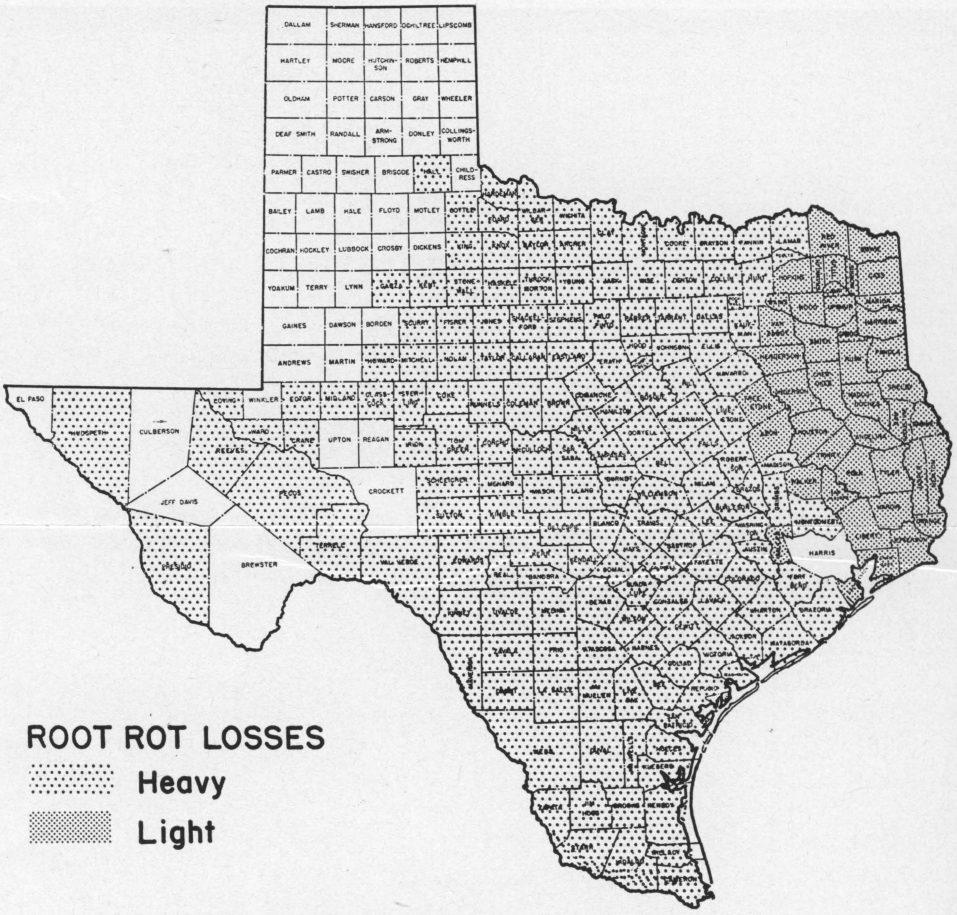


Fig. 1. Occurrence of cotton root rot in Texas. The disease has not been reported in the white areas.

ROOT ROT LOSSES OF COTTON CAN BE REDUCED

HARLAN E. SMITH, FRED C. ELLIOTT and L. S. BIRD*

CAUSE AND DISTRIBUTION

Root rot is one of the most common plant diseases in Texas. It has been called dying-out, dying-off, alkali, cotton root rot, Texas root rot and Phymatotrichum root rot. The disease is caused by a fungus, *Phymatotrichum omnivorum*. It occurs over all of Texas except the Texas Panhandle and High Plains (see map). The disease also occurs in Mexico, New Mexico, Arizona, California, Oklahoma, Arkansas, Nevada, Utah and Louisiana. It is prevalent in highly fertile, calcareous, alkaline soils.

IMPORTANCE

Over 2,000 species of plants are susceptible in varying degrees. The disease fungus may live on some types of trees, shrubs and weeds without killing them. About 80 percent of wild and cultivated plants are susceptible. Approximately 270 species of cultivated plants are subject to root rot attacks. It is not unusual for over 50 percent of plants in a cotton field to be killed by the disease in certain areas. On an average, the percent yield reduction in cotton is approximately equal to half the percentage of plants killed. In some wet years, the disease reduces the potential average yield by 25 percent in the Blackland Prairies. In recent years the disease has caused considerable damage in many areas of South Texas including the Lower Rio Grande Valley and in irrigated areas of West Texas. When land is known to be badly infested, its value is lowered considerably. During 1958, 1959 and 1960 the disease reduced Texas production of cotton on the average by 3.27 percent. Cotton produced on stalks killed by the root rot fungus may have lower micronaire of immature fibers, shorter staple, spotted grades, poor quality seed and one-sided bales. Cotton stalks killed by the root rot fungus interfere with mechanical harvesting. The disease damages many shade trees, shrubs and flowers. For control of the disease on crops other than cotton see Agricultural Extension Leaflet 390, Cotton Root Rot.

*Respectively, extension plant pathologist; extension cotton work specialist; and associate professor of plant pathology, The A&M College of Texas, and agent, Cotton Research Branch, USDA.

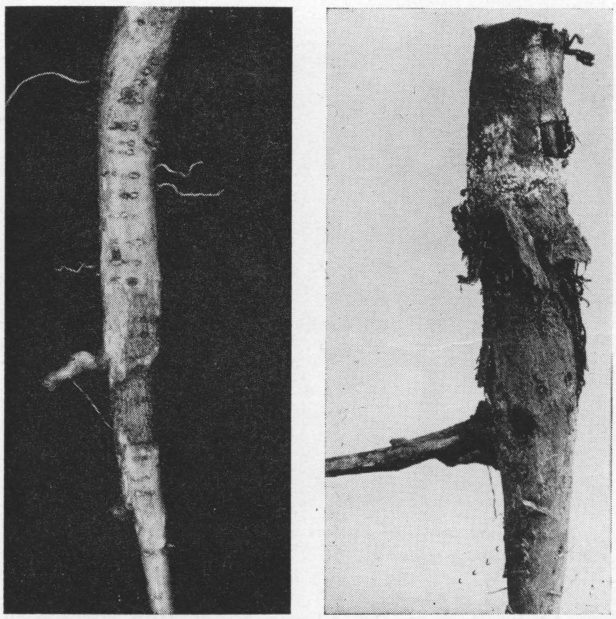


Fig. 2. Left, section of cotton root beginning to decay as result of root rot damage; right, portion of root and lower stalk of cotton killed by root rot. Note rotted bark of root.

SYMPTOMS

Root rot starts to occur in late April in the Lower Rio Grande Valley. The disease continues to damage plants until frost in some areas. The disease fungus kills plants in circular areas ranging from a few square yards to an acre or more in size. Only a few plants in a row may be killed. When rains occur during the latter half of the growing season, the first dead plants generally appear soon after. The plants die suddenly, often after having made excellent growth. Prior to showing severe symptoms, the cotton plants have a fever, or higher temperature than normal. This can be discovered by feeling the leaves. Death occurs within a few days after the first wilting. In affected plants, the whole root system decays. The plants easily pull out of the soil. The disease should not be confused with fusarium wilt or verticillium wilt. The outer bark on the tap root twists off easily on root rot-damaged cotton plants. This bark does not come off easily on plants damaged by wilts. When bark from the soil line area is peeled back, root rot infested stalks are a brownish-red.

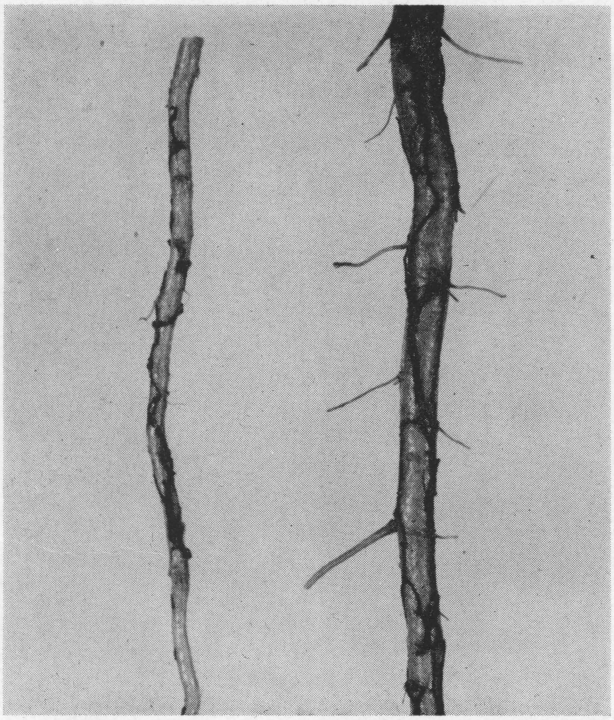


Fig. 3. Sections of cotton root showing strands of root rot fungus on surface.

Affected root rot plants show fine, brownish strands of fungus threads (rhizomorphs) sparsely covering the rotted roots. Under the microscope, the fibers clothing these strands have rigid needle-like sidebranches at right angles to the main fibers. (See Figure 4.) Under moist conditions, spore mats sometimes appear on the soil near diseased plants. These are 2 to 12 inches in diameter, at first snow-white and cottony, later tan and powdery. Numerous, small cushion-like sclerotia or resting bodies about the size of a pin head are on large roots. These sclerotia are at first light-colored, later becoming dark and warty.

OTHER FACTS ABOUT THE DISEASE

The fungus can live in the soil for years. It overwinters or lives through drouths in an active state in living plant roots or as dormant sclerotia. The disease spreads from plant to plant by growth of the fungus through the soil, primarily along the roots of infected plants. The rate of spread from cotton plant to cotton plant is 5 to 30 feet per season. The movement of soil by cultivation appears to play no part in the spread of the disease.

If a root rot spot is staked out and the development of the spot is observed for several years, it will be seen that the spot slowly enlarges for 2 to 8 years. Then it suddenly or gradually breaks up, leaving most of the spot bearing healthy plants, but with a few separated diseased spots enlarging over the next few years, joining with the others and reforming the original spot. Breaking up of these spots is unrelated to weather or cultural conditions. There is some evidence that it is due to natural enemies of the fungus or competition in the soil between the root rot fungus and other soil organisms.

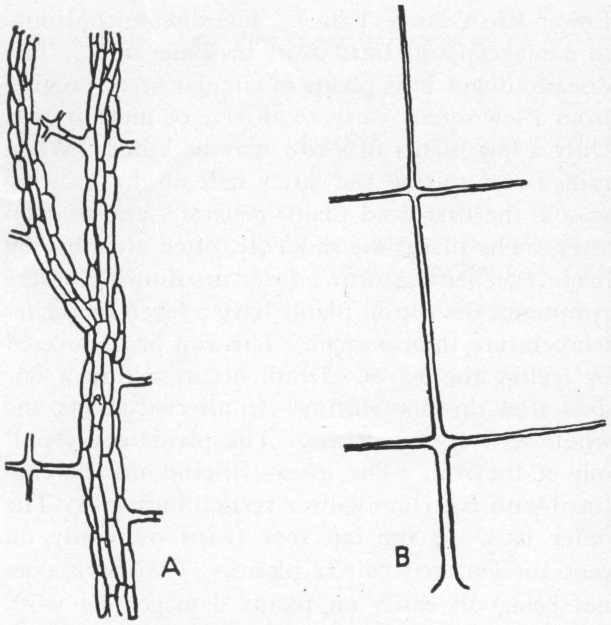


Fig. 4. Root rot fungus magnified 400 times: A, "rope" of hyphae; B, acicular hyphae.

Fig. 5. White spore mats of cotton root rot fungus on surface of soil near diseased cotton plants.

Fig. 6. Aerial view of cotton damaged by root rot. Note darkened plants killed by the disease.

The disease flourishes with moderate moisture and is suppressed under very dry or very wet conditions. It also is unable to survive where the lowest temperatures are 10 degrees below zero.

WAYS TO REDUCE ROOT ROT

A combination of practices that are carried on each year is necessary for best results. Where recommended practices are carried out over a period of one to three years, root rot damage is reduced to 5 percent or less. It is necessary to follow the recommended practices continuously in order to keep the damage below 5 percent. No chemical treatment has been proved economical for control on cotton. Recommended practices vary in different areas of the state. A long-range program using the following practices is advisable because the control effect is accumulative.

1. ***Prepare map of farm or ranch.***

Check root rot infested areas and record this information on the map. Keep this map up-to-date each year.

2. ***Bury large tonnage of organic matter.***

Just before growing cotton bury up to 5 tons (dry weight) of green or dry organic matter. Turn the crop residues of grain sorghum, oats, wheat, barley, corn or cotton burs under 6 to 12 inches deep. Grain sorghum has proven to be especially effective. Shred the stubble and add additional nitrogen fertilizer before burying the crop residue. Turn under green-manure crops of adapted sweetclovers or winter peas just prior to growing cotton. To be most effective against root rot old crop residue in the soil should be decomposing most rapidly during early flowering stage of the cotton. Organic matter is buried deeply in order for it to be in that part of the soil where the root rot fungus occurs.

Buried organic matter causes an increase in the number of soil organisms which are antagonistic to the root rot fungus. Thus the organic matter may increase the number of beneficial micro-organisms in the soil. These in turn apparently help to destroy or reduce the amount of disease fungus.

3. ***Deep-plow infested areas with moldboard plow.***

Deep-plow 6 to 18 inches in the summer or early fall when the soil is dry. Avoid turning up poor sub-soil when deep plowing. Do not irrigate after deep plowing for at least two weeks. Two weeks following the deep plowing the soil may be disked, bedded or treated in the usual manner. Where soil erosion is a problem the old crop residue may be partially brought back to the surface with the bedder. Where cotton is to be grown on deep plowed soil and where organic matter is buried more fertilizer may need to be applied. Apparently the deep plowing helps to kill the root rot fungus by drying, aeration, killing old cotton roots and destroying roots of susceptible weeds. Because the fungus occurs at depths of 8 feet in the soil it is impossible to economically eradicate it. However, because most of the fungus occurs in the top 12 to 20 inches of soil deep plow-

Fig. 7. Center, cotton plants killed by cotton root rot. On each side, corn undamaged.

ing is one of the effective practices in reducing the disease.

4. ***Produce early cotton.***

In most cases early planted cotton has more mature bolls before it is killed by root rot. The prevention of seedling diseases and early insect control will help to produce early cotton.

Seedling disease damage is reduced by planting high-quality, disease-free seed that have been properly treated with an approved protectant fungicide. The use of chemicals in the covering soil at planting helps reduce seedling disease.

Avoid excessive planting rates, if possible, to prevent spread of root rot. Thirty pounds of seed per acre should be a maximum unless crusting is a problem.

5. ***Grow resistant crops in rotation.***

Growing cotton in rotation with non-susceptible crops prevents an additional build-up of the root rot fungus. Rotation also allows more time for producing and burying more organic matter. It helps reduce root rot only a very small amount where deep plowing and turning under of organic matter is not practiced. In most rotations cotton is grown each second, third or fourth year. Resistant crops are grown in remaining years.

Some immune or resistant crops are: grain and forage sorghum, cane, Sudangrass, corn, broom corn, sweet corn, wheat, oats, barley, rye, grasses, rice, asparagus, cabbage, Chinese cabbage, garlic, leek, onion, pumpkin, broccoli, Brussel sprouts, cantaloupe, cauliflower, celery, common stock, cucumber, kale, mustard greens, rape, spinach, squash, date palm, strawberry, dewberry, kumquat, weeping mulberry and orange (hardy, Mexican and sour). Certain ornamental plants may be grown in commercial nurseries on infested soil. (See Agri. Ext. Leaflet 390.)

Ways to Reduce Root Rot

Bury large tonnage of organic matter

Deep-plow badly infested areas

Produce early cotton

Grow resistant crops in rotation

Remember

A combination of practices carried on for a number of years is necessary for best results.

Your County

EXTENSION AGENTS

can furnish you the latest information on farming, ranching and homemaking. They represent both The Texas A. & M. College System and the United States Department of Agriculture in your county.

Most county extension agents have their offices in the county courthouse or agriculture building. They welcome your visits, calls or letters for assistance.

This publication is one of many prepared by the Texas Agricultural Extension Service to present up-to-date, authoritative information, based on results of research. Extension publications are available from your local agents or from the Agricultural Information Office, College Station, Texas.

Cooperative Extension Work in Agriculture and Home Economics, The Texas A&M College System and the United States Department of Agriculture cooperating. Distributed in furtherance of the Acts of Congress of May 8, 1914, as amended, and June 30, 1914.
25M—8-62, Revised