Cotton Root Rot

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This fungal disease is also known as *Phymatotrichum* root rot, Texas root rot and *Ozonium* root rot. It is caused by one of the most destructive fungal plant disease organisms, *Phymatotrichum omnivorum*, that can attack more than 2,000 species of plants. However, monocotyledonous plants (grasses, etc.) have field resistance. In Texas, the disease is economically important in cotton, ornamentals and fruit, nut and shade trees. The fungus is prevalent in calcareous clay loam soils with a pH range of 7.0 to 8.5 and in areas with high summer temperatures. Therefore, the disease is limited to the Southwestern United States.

Cotton root rot has been reported in Texas counties from the Red River to the Rio Grande and from Tom Green County to the Neches River.

Disease Symptoms – Symptoms are most likely to occur from June through September when soil temperatures reach 28 °C (82 °F). The first symptoms are slight yellowing or bronzing of the leaves. The upper-most leaves wilt within 24 to 48 hours after bronzing, followed by wilting of the lower leaves within 72 hours. Permanent wilt occurs by the third day, followed by death. The leaves remain firmly attached to the plant. Affected plants die suddenly, often after excellent growth. Trees and shrubs may die more slowly.

Roots are usually extensively invaded by the fungus by the time wilting occurs. Affected plants can be pulled from the soil with little effort. Root bark is decayed and brownish, and bronze colored wooly strands of the fungus are frequently apparent on the root surface.

The fungus generally invades new areas by continual slow growth through the soil from plant to plant. It may also be moved about on roots of infected plants moved to new areas. The fungus can survive in the soil for many years and often is found as deep in the soil as roots penetrate. Affected areas often appear as circular patterns of dead plants. These areas gradually enlarge during the season or in subsequent years as the fungus grows through the soil from plant to plant. Infested areas in cotton may increase 5 to 30 feet per year in cotton.

Causal Organisms – *Phymatotrichum omnivorum* exists in the soil in three distinct forms:

Hyphae and strands (rhizomorph)	The fungus produces root-like (rhizomorph) strands that grow through the soil until coming in contact with growing plant roots. Strands grow on roots toward the soil surface. Immediately below the soil surface in cotton, the fungus proliferates around the hypocotyl, producing a cottony, mycelial growth. The bark is destroyed by this mycelium and the fungus fills the vascular tissue of the plant. Sclerotia form in the strands following death of the plant.

Sclerotia	Sclerotia form from strands and the cells divide, grow, and enlarge. These sclerotia are small (1/32 to 1/16 inch in diameter), densely compact masses of thick walled cells. Sclerotia are first white, changing to buff, brown and black with age. They are irregular in shape, generally taking the shape of the pore space where they are formed. Sclerotia enable the fungus to persist in fallow soil or soil planted to resistant crops for several years. Sclerotia have been found up to 12 feet deep in some soils.
Spore mats and conidia	The fungus often forms spore mats on the soil surface during warm, rainy weather. These mats vary in size from 2 to 16 inches in diameter and are white to tan colored. They are composed of large celled, branched fungal strands that later produce conidia. The conidia are apparently sterile.

Control – Cotton root rot is one of the most difficult plant diseases to control. Fungal behavior in different crops, soils and from year to year in the same field are so erratic that several approaches should be used.

Landscape – A list of ornamental plants with some resistance to cotton root rot is found in Bulletin L-2056.

Rotation. Research shows that rotations of 3 or 4 years with a monocotyledonous crop have reduced disease incidence up to 60 percent on cotton in some instances. Shorter rotations are less effective.

Organic amendments. Significant control of cotton root rot has been achieved by using residues of various crops. A delay in infection of cotton is readily apparent and has resulted in up to 90 percent reduction in root rot. Wheat, oats, and other cereal crops are effective in delaying infection and reducing losses when incorporated in soil in the spring before cotton is planted.

Deep plowing. Use of a moldboard plow to flat break infested areas 6 to 10 inches deep has markedly reduced the incidence of disease. Flat breaking immediately after cotton harvest reduces the strands' ability to form sclerotia. The upper 6 inches of soil should thus have a reduced sclerotia level where 90 percent of the roots of a cotton plant are found.

Plant barriers. This technique consists of planting a resistant grass crop such as sorghum around an infected area in a field. These barriers either exclude or limit the spread of disease within the field.

Fertilizer applications. When nitrogen is applied as ammonia in a manner to fumigate as much soil as possible, root rot may be reduced. Early plant maturity. A successful technique for cotton is to plant early maturing varieties, such as TAMCOT CAMD-E, TAMCOT SP37H and TAMCOT CAB-CS, as early as possible in the season so that the crops reach maturity before the plant is killed by the disease. Disease activity increases from June through August; therefore, complete production as early as possible.

Cotton Root Rot Control Strategy for Cotton

1. Map fields to define areas infested with the fungus.
2. Shred stalks, moldboard plow and flat break infested areas immediately after harvest 6 to 10 inches deep. Base the depth on equipment and horsepower of tractor. Use sufficient speed to insure good inversion of the plow slice.
3. Prepare field and bed land for sorghum after a 2 week delay.
4. Use maximum recommended amount of fertilizer for sorghum or corn production and apply the nitrogen as ammonia. Apply the ammonia to
5. Plant sorghum or corn next season.
6. After sorghum or small grain harvest, immediately prepare land for cotton using minimum fertilization.
7. Next spring, plant cotton as early as possible using an early maturing variety such as TAMCOT SP37H, CAMD-E OR CAB-CS.
8. Repeat cycle by again mapping infested areas and deep plowing.

Note: To control root rot, use a total program. By significantly controlling the incidence of root rot at the end of the first rotation, almost total control is possible by the second rotation. Continual monitoring and repeating treatments may be necessary from time to time.