The Oklahoma Cooperative Extension Service Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Phymatotrichum Root Rot

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http://osufacts.okstate.edu

Phymatotrichum root rot, also known as cotton root rot and Texas root rot, is caused by the fungus *Phymatotrichopsis ominvorum*. The fungus attacks more than 2,000 species of broadleaf plants, but does not affect monocots (grasses). The disease is economically important to cotton, alfalfa, peanut, ornamental shrubs, and fruit, nut and shade trees.

The fungus is capable of persisting for a long period of time in the soil. It is most destructive in soils that are of limestone origin (calcareous), highly alkaline (high pH), and are exposed to high summer temperatures. Therefore, soil type and cold temperatures limit the geographic distribution of this disease to areas in the southwestern and south central United States. In Oklahoma, Phymatotrichum root rot is mostly restricted to the southern tier of counties in the Red River Valley. The disease has been reported in the following counties: Atoka, Bryan, Carter, Choctaw, Comanche, Cotton, Garvin, Jefferson, Johnson, Kiowa, Love, Marshall, McCurtain, Muskogee, Pushmataha, Stephens, and Tillman.

Symptoms

Symptoms of Phymatotrichum root rot occur most often from June through September after soil temperatures reach 82 F. In row crops, symptoms appear as patches of wilted plants, which rapidly die. Trees and shrubs may die more slowly. The leaves of affected plants dry, turn brown, and remain attached to the plant. Affected areas expand to form circular areas of dead plants (Figures 1 and 2). Newly wilted plants develop at the leading edge of the affected areas as the infection centers enlarge during warm, moist periods. Grassy weeds may invade areas killed by the fungus. Affected areas continue to enlarge in subsequent years as the fungus grows through the soil from plant to plant. Reported rates of spread for alfalfa may be as much as 2 to 8 feet per month in mid summer and 5 to 30 feet per year in cotton.

Taproots of newly wilted plants are severely decayed. The surface of decayed roots may be partly covered by a fuzzy, tan-colored mold (mycelium). The bark strips readily from the surface of decayed roots, revealing a reddish brown stain along the white woody tissue.

A unique feature of this disease is the production of spore mats that may form on the soil surface near dead plants. The spore mats are circular patches of white moldy growth of varying size. The spore mats turn tan in color before they dissipate after a few days.

Disease Cycle

The fungus survives almost indefinitely in the soil as small (1 to 5 mm in diameter), resistant, seed-like structures called sclerotia. Sclerotia have been recovered from soil at depths of up to 8 feet. In the summer, mycelium from germinating sclerotia or from fungal fragments overwintering on roots of perennial plants infects nearby roots. The fungus enters the roots of infected plants, decaying the bark and penetrating the woody portions of the root. Nutrients derived from infected plants support the growth of the fungus through the soil to infect new plants. The function of spores produced on spore mats in the disease cycle is unknown.

The fungus appears to be indigenous to certain fields and there is little known on how the fungus spreads to new fields. However, disease may develop following the transplanting of infected plants.

Control

Although there are several management practices available that help reduce the occurrence and severity of this disease, none are highly effective. Attempts to control the disease with fungicides and soil fumigation have not been successful. The most effective strategy is to define areas infested with the fungus and plant crops and plant species that are not susceptible to the disease.

Use of a moldboard plow (6 to 8 inches deep) has reduced the disease. Deep plowing immediately after harvest is thought to disrupt the formation of sclerotia in the upper soil profile.

Crop rotation for three to four years with a grass crop such as grain sorghum has been beneficial in some instances. Rotation may not reduce levels of sclerotia in the soil. The effects of crop rotation are thought to result from the addition of organic matter to the soil, which increases the activity of soil microorganisms that compete with or inhibit the fungus. The direct addition of organic matter to soil and the incorporation of green manure into soil are thought to produce the same beneficial effect. The decomposition of green manure also may liberate chemicals that inhibit the fungus.

Barriers of resistant crops can be used to limit the spread of the fungus. Grain sorghum is typically planted in border rows surrounding infested areas.

Planting early and the use of early maturing varieties have been used in some crops to escape the disease. The goal is to harvest before the disease becomes active in the summer. In Oklahoma, vegetable production systems in the spring may be useful.

Figure 1. Circular area of alfalfa killed by Phymatotrichum root rot.

Addition of fertilizers and other amendments such as sulfur have been used in attempts to change the alkalinity of the soil, but results have been variable. Nitrogen applied as anhydrous ammonia may be beneficial for cotton production. However, one of the more effective treatments was devised in Arizona in 1939 for infected trees and shrubs and for replanting valuable plants into infested sites. A ridge of soil is formed around each plant at the drip line. The entire basin within the ridge is covered with cow manure or similar organic matter to a depth of 2 inches. Ammonium sulfate and sulfur, each at a rate of 1 lb. per 10 sq. ft., is broadcast over the manure. The basin is then flooded with sufficient water to soak the soil to a depth of 3 feet.

Trees or shrubs showing slight symptoms of the disease also can be cut back to one-half the top growth to compensate for roots lost to the disease. The soil should be kept moist for several weeks after treatment. Recovery is usually complete within the season. This technique is most effective when applied before the root rot is extensive.

Resistant varieties have not been developed for crops that are normally susceptible to the disease. Therefore, crop and plant species that are naturally resistant must be selected. The following list is intended to aid in selecting resistant plants and avoiding susceptible ones for areas known to be infested.

Shade and Ornamental Trees

Shade and Flowering Trees

Susceptible and Intermediate

Alder
Ash
Beech
Black Locust
Catalpa
Chestnut
Chinese Tallow Tree
Chinquapin oak
Chittanwood
*Cottonwood
Cypress
*Dogwood
Elm (all but cedar-elm)
Filbert
Hawthorn
Hazelnut
Honeylocust
Hoptree
Hop-hornbeam
Locust
*Silver Maple
*Mulberry (all but weeping)
Oak (all except live oak)
*Pistachio
Poplar
Redbud
Sassafras
Soapberry
Sweet Gum
Tree of Heaven
Willow
Witch Hazel
*Texas Umbrella

Resistant

Cedar-elm
Live Oak
Southern Magnolia
Weeping Mulberry

Conifers

Susceptible and Intermediate

Arborvitae
Cypress
Pine (all but Japanese Red Pine)
Spruce

Resistant

Cedar (Juniper)
Japanese Red Pine

Shrubs

Susceptible

Amur and Chinese Privet
Cotoneaster
Euonymus
Lilac
*Loquat
*Roses
Spirea(s)
*Waxleaf Ligustrum
(*Ligustrum lucidum*)

Intermediate

Arborvitae
Butterfly Bush (Buddleia)
Boxwood
Cactus
California Privet
Japanese Barberry
Jasmine
Japanese Privet
(*Lingustrum japonicum*)
Laurel
Pyracantha
Rhododendron
Trumpet Creeper (Campsis)
Virginia Creeper
Ivy (Hedera)
Rhus copallina lanceloata

Resistant

Bamboo
Crape myrtle
Holly
Evergreen honeysuckle
Eucalyptus
Oleander
Pomegranate

Fruit and Nut Crops

Susceptible

Apple
Apricot
Avocado
Cherry
Grape
Japanese persimmon
Peach
Pear
Quince
Walnut

Intermediate

Blackberry
Common persimmon
Gooseberry
Pecan
Plum
Raspberry
Red Currant

Resistant

Black Currant
Strawberry

Vegetable Crops

Susceptible

Beans
Beets
Carrots
Chard
Endive
Horseradish
Jerusalem artichoke
Lima beans
Okra
Parsnip
Pepper
Rhubarb
Salsify
Sweet potato

Intermediate

Eggplant
Globe artichoke
Irish potato
Lettuce
Radish
Rutabaga
Tomato
Turnip
Watermelon

Resistant

Asparagus
Cabbage
Cantaloupe
Celery
Cauliflower
Cucumber
English pea
Garlic
Kale
Mint
Onion
Spinach
Squashes (most)

Flowers

Susceptible

Chrysanthemum
Dahlia
Hollyhock
Peony
Poinsettia

Intermediate

China Aster
Cosmos
Morningglory
Sunflower

Resistant

Calendula
Calla Lily
Candytuft
Carnation
Coleus
Columbine
Crocus
Ferns
Gaillardia
Geranium
Gladiolus
Gypsophila
Hibiscus
Iris
Lily
Larkspur
Mignonette (Reseda)
Narcissus
Nasturtium
Pansy
Petunia
Phlox
Poppy
Sage
Snapdragon
Stock
Sweet pea
Sweet William
Tube-Rose
Tulip
Verbena
Vinca (Periwinkle)
Violet
Zinnia

Field Crops

Susceptible

Alfalfa
Cotton
Cowpeas
Peanuts
Soybeans
Velvet beans

Intermediate

Broad beans
Flax
Mung beans
Vetch

Resistant

All grasses
Barley
Corn
Millet
Oats
Rye
Sorghum
Wheat

*Highly susceptible