Pythium overview:
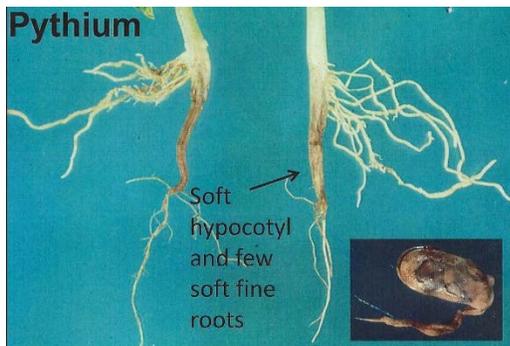

Pythium is an **Oomycete soilborne pathogen.** It can be found in soil, sand, pond and stream water and their sediments and in the dead roots of previous crops. There are many types of Pythium that effect a wide variety of crops. It is found across the globe including the Americas, Asia, Africa and Australia. It is a significant cause of damage to turf. It effects most plant families and is a major problem in greenhouses and nurseries. Pythium is very difficult to control once established.

Symptoms: Stunted growth, Chlorotic (appearance close to the look of a nitrogen deficiency), mid-day wilt, reduced plant populations, retarded maturation, collapse and death, brown and sometimes dead root tips, plants yellow and die, water soaked appearance on roots, and brown tissue on the outer portion of the root that easily pulls off leaving a strand of vascular tissue exposed.

Favorable Environmental Conditions: Abundant soil moisture, high (above 77F) and low temperatures (below 68F) depending on species, high soluble salts, over-watering, over-fertilization and misuse of fungicides (which can cause fungicide resistant strains).

Management Options Include: Potting mix heated to 180F for 30 minutes, slow sand filtration for water, proper sanitation/disinfection of equipment, fungicide or biological control agents (note many fungicides that work on the other root diseases we look for do not work on Fusarium so it is essential to be sure of what disease one has).
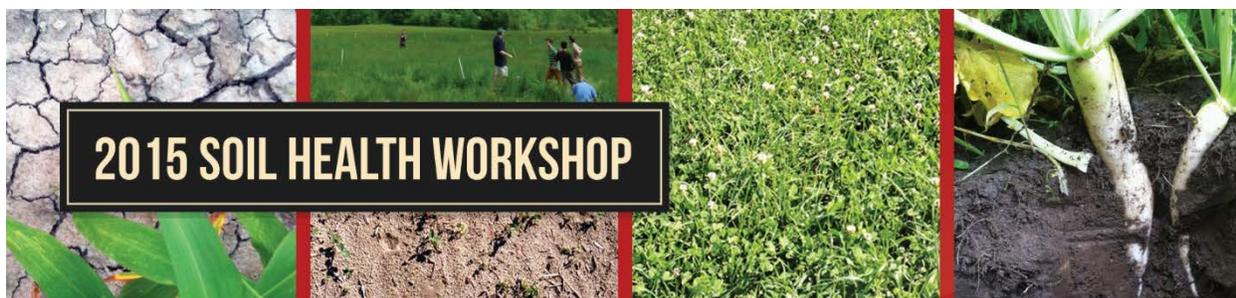
Thielaviopsis-(Common name Black Root Rot) Overview:
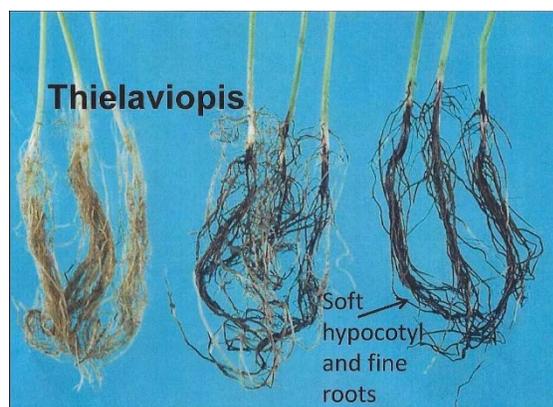
Thielaviopsis is a **soilborne fungal pathogen**. It has a worldwide distribution. It effects plants from at least 15 families including many shrubs, flowers, houseplants and fruit and vegetables including: Carrot, Tomato, Tobacco, Beans and Clover. It is of major concern with Tobacco in China and had led to yield losses up to 75%. It can survive in the soil for a very long time and can be spread through irrigation water.

Symptoms: Stunting of foliage and root systems, blackened areas on roots, yellowing of leaves between the veins or along the margins, branch dieback, defoliation, damage to seedlings, red leasons that turn black on the roots, stunting of tap-root growth, root rot becoming collar rot if left unchecked, marginal leaf scorch and overall plant decline.
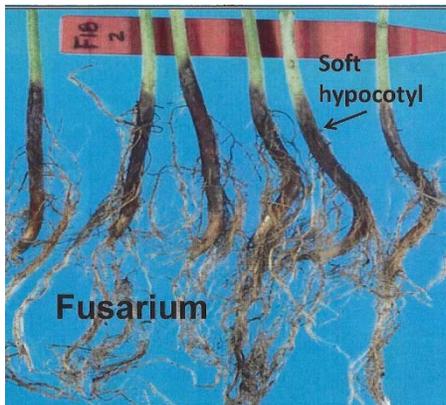
Favorable Environmental Conditions: Soil temperatures between 50-70F, pH between 5-8.5, and over fertilization.

Management options include: Fungicides, good sanitation, keeping pH above 5.6, remove and destroy infected plants, mycorrhiza fungi.

Fusarium overview:

Fusarium is a **fungal pathogen**. It can occur in many grass species including weeds and crops. It is most common in wheat, durum and barley. It can also effect corn, causing stalk and cob rot. It can also effect the nightshade family. It is major wheat disease in the United States. It has a significant effect on the yields of these crops and can also be associated with the development of mycotoxins.

Symptoms: Fusarium can cause bleaching of the heads of wheat and durum, yellowing, stunting and death in seedlings, wilting, and the dying off of lower leaves. Evidence of the disease on the roots appears as a brown/purple color on the peduncle (immediately below the head) or stem tissue.

Favorable Environmental Conditions: In general high temperatures encourage the spread of Fusarium and it may not become active in soils at lower temperatures. 48-72 hours of high humidity and temperatures of 23-29C are very favorable for spore production. The fungi reproduces in crop residues. Spores can travel high distances via wind.

Management options include: Multiple simultaneous management strategies are the best solution, some of which include: Disease resistant seeds (which are not very effective), tillage (any tillage that buries the top layer or helps with greater speed of decomposition-while still considering good soil health management practices) long crop rotation (do not follow with grains instead use any non-grass species for example soybean-4-6 year rotations), heat treatment (in Annual crops), liming of the soil (effective in some plants like tomatoes), destroying and removing infected crop material after harvest, maintaining high level of plant vigor, and fungicides.

Rhizoctonia overview:

Rhizoctonia is a **soilborne fungal pathogen** and effects almost all cultivated plants. There are different strains which vary in their host range and pathogenicity. It has common names that refer to the specific effect it has on a crop: for instance "Black Scurf of Potato Tubers" and "Crater Rot of Beetroot". Once Rhizoctonia is introduced to a soil it remains there indefinitely. It is almost exclusively in the top 15-20cm of soil. The root rot can cause the plants to break in high winds, significantly reduce nodulation and encourage yellowing and wilting of leaves. Rhizoctonia is very common in Soy Bean production with low levels of rotation. In Soy it is generally a seedling disease but can effect older plants. When soil populations are high, Rhizoctonia can cause up to a 50% reduction in crop stands.

Symptoms: The symptoms of vary depending on the crop. Common effects include: Damping off of seedlings, root and stem rot, stem cankers, seed decay and fruit rot. Stem cankers are brown to reddish lesions on the stems and roots just below the soil.

Favorable Environmental Conditions: Damage is more common in warm, moist sandy soils. Herbicide injury, soil insect damage, drought, cool wet springs, and hail intensify effect of disease.

Management options include: Crop rotation, treat seeds with biological fungicide or strobilurin, midseason cultivating of the soil (in the case of potatoes), avoid stressing the plants, avoid soil contacting fruit or seed of plant through the use of mulch, ensure crop residues decompose before replanting in affected areas and fungicide application to soil.