Small Grains

Take-All

Identification and Life Cycle

Gaeumannomyces graminis tritici

Identification and Life Cycle

On roots and lower stems, pathogen produces a superficial, brownish-black, shiny mycelial mat or plate that surrounds the base of the stem (culm) below the lowest leaf sheath.
Under prolonged moist conditions, the leaf sheath surrounding this mycelial plate may become speckled in appearance do to the development of dark colored, erumpent perithecia.
Brownish-black, shiny mycelial plate and dark colored perithecia are not always produced in infected plants, making diagnosis of Take-All more difficult and dependent upon close examination of roots for internal and superficial dark colored mycelium and runner hyphae.
Coarse runner hyphae of the pathogen are often grouped in strands several millimeters long, and conspicuous on infected intact roots.
Infection pads (simple hyphopodia) develop in contact with surface of host tissue, somewhat like appressoria, each having a transport pore through which the host in penetrated via a hyphal peg.
Hyphopodia are flattened, 9-4-15 um in diameter, and slightly darker in color than the hyphae that bear them.
Runner hyphae are septate, 4-7 um wide, and frequently grouped in strands. unitunicate asci that give rise to ascospores (70-100 umin length).
Gaeumannomyces graminis var. tritici persists in infected host plants and in host debris.
Both hyphae and ascospores can serve as primary inoculum. Wheat roots become infected as they grow through the soil near infested debris.
Roots are initially colonized superficially by the dark-pigmented runner hyphaeInfection can occur throughout the growing season, optimal temperature for infection ranging from 10 degrees C to 20 degrees C.
Pathogen moved around in field by runner hyphae and by ascospores (splashing precipitation and/or irrigation water).
During hot and dry conditions, the pathogen becomes inactive.
Soil conditions that favor the pathogen include: neutral to alkaline soils, especially those deficient in nitrogen and /or phosphorus, poorly drained soils.
Continuous cropping of wheat significantly favors the pathogen.
Other closely related pathogens:
Gaeumannomyces graminis var. avenae, infects oats and bentgrass (Agrostis spp) also produce simple hyphopodia, but its ascospores are longer (110-130 um).
Gaeumannomyces graminis var. graminis is a pathogen of many grasses, but is only weakly pathogenic on wheat.
Gaeumannomyces graminis var. graminis produces as ascospores 70-100 um in length (similar to tose of Gaeumannomyces graminis var. tritici) but has a lobed hyphopodia.
Plant Response and Damage
Take-All is a major disease of autumn-seeded wheat.
Diseased stems are weakened at their base, causing them to lean and fall non-directionally (as in Foot Rot).
Take-All can be a serious disease of wheat grown in temperate climates, where moisture is plentiful, especially in fields where soil pH is neutral to alkaline, and most likely to occur in fields where wheat is continuously cropped.
Moderate to high infected host residue levels favor this disease.
Disease severity is related to the extent and time of infection of roots and stem (culm) bases.
Many wheat plants can withstand mild root infections and appear symptomless; severely infected wheat plants are stunted and ripen rematurely, significantly reducing seed yields.
Wheat plants may appear to ripen prematurely when water transport through roots and stems (culms) does not keep pace with water loss through leaves.
The sudden development and appearance of whiteheads after a period of hot, dry weather gives the impression that the disease develops late in the season and that disease development is favored by hot, dry conditions. However, pathogen activity is actually favored by cooler temperatures earlier in the growing season, and later occurring hot, dry weather accelerates the water stress and premature ripening.

Management Approaches

No wheat or barley cultivars are resistant to infection by the Take-All fungus.
Crop rotation is the best way to control Take-All; usually a 1 year break from wheat and/or barley is sufficient to reduce soil borne inoculum to inconsequential levels.
Tilliage can be helpful in the management of Gaeumannomyces graminis var. tritici by fragmenting and hastening the decomposition of the infested residue (Although there are reports that Take-All can be less severe in fields maintained as no-till, where wheat is direct seeded.
Oats, corn, and dicotyledonous crops are suitable alternative crops.
Soil amendments that lower the soil pH to 6.0 or below may also be helpful for managing Take-All.
Adequate supplies of nitrogen, phosphorus, potassium, and certain trace elements should be available to wheat plants throughout the growing season.

Biological Control

There are reports of naturally occurring

Biological Control

mircrorganisms, that are considered to be responsible for a phenomenon known as "Take-All Decline".
Take-All Decline often occurs after several years of severe incidence of Take-All.
Take-All Decline is due to build up of microorganisms antagonistic to Gaeumannomyces graminis var. tritici<<< NEED MORE INFORMATION ABOUT THESE BIOCONTROL AGENTS!

Cultural Control

Crop rotation is the best way to control Take-All; usually a 1 year break from wheat and/or barley is sufficient to reduce soil borne inoculum to inconsequential levels.
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Soil amendments that lower the soil pH to 6.0 or below may also be helpful for managing Take-All.
In fields where the soil is slightly acidic (5.5-6.0), the use of chloride in combination with ammonium in the seed furrow may provide some control of Gaeumannomyces graminis var. tritici.
Ammonical and slow-release forms of nitrogen may suppress Take-All, but nitrates may favor Take-All.
Adequate supplies of nitrogen, phosphorus, potassium, and certain trace elements should be available to wheat plants throughout the growing season

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