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Take-All Root Rot of Warm-Season Turf

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Introduction

Sometimes referred to as bermudagrass decline, take-all root rot can be a serious turf disease of warm-season grasses such as zoysiagrass (*Zoysia* spp.), centipedegrass (*Eremochloa ophiuroides*) and bermudagrass (*Cynodon* spp.). It can also be a significant problem in St. Augustinegrass (*Stenotaphrum secundatum*) throughout the southern states, where it may be confused with another fungal disease called brown patch.

Take-all root rot is caused by the fungus *Gaeumannomyces graminis* var. *graminis*. The primary damage to the turf occurs from root infections, but stolons and rhizomes can also be infected. Stressed or weakened turf tends to be more susceptible to pathogen attack, especially during moist and warm conditions in the early spring and summer. High soil pH, soil compaction, improper fertility, improper cutting height, herbicide injury and moisture imbalances can predispose turf to attack by the fungus.

Symptoms

Take-all is a disease of the roots. Symptoms of take-all root rot usually become apparent from early spring through early summer, suggesting infection may occur during the previous fall. Initially, the affected turf becomes wilted and yellow, followed by the development of thin, bare areas as plants die. These declining areas can be irregular in shape and can vary in size from 1 foot to more than 20 feet in diameter (**Figure 1**). Turf can usually be pulled from the soil quite easily as a result of infection. Dark strands of mycelium (**ectotrophic runner hyphae**) of the fungus can develop on the roots and stolons (**Figure 2**), giving them a

Figure 1. Irregular declining areas of take-all root rot *(Courtesy M. Peterson)*

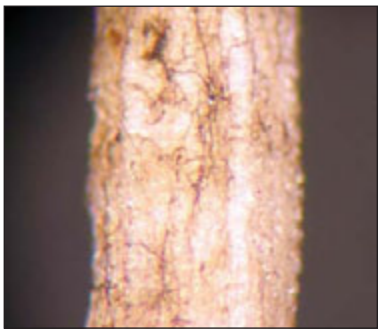

Figure 2. Ectotrophic runner hyphae of *Gaeumannomyces graminis* var. *graminis* on a zoysiagrass root

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dark brown to black discoloration. Specialized infection structures (**hyphopodia**) formed by the fungus are useful for diagnosis (**Figure 3**).

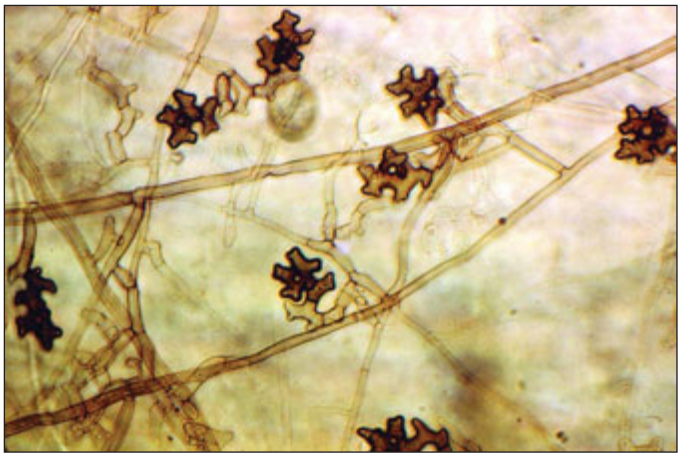

Figure 3. Characteristic lobed hyphopodia of *Gaeumannomyces graminis* var. *graminis*. Some describe this as "puzzle piece-like" *(Courtesy P. Landschoot)*

Disease Cycle

Gaeumannomyces graminis var. *graminis* survives on infected roots, stolons and rhizomes as mycelium. The fungus may be disseminated by verticutters and other machinery that can move infected roots, rhizomes and stolons. The fungus does not attack the leaves. Sod, stolons, rhizomes and soil can also spread the fungus from one location to another.

Management

Management efforts should focus on cultural control rather than chemical. Currently, no resistant cultivars are available. Any stress placed on the turf can promote or intensify the disease. Proper plant nutrition and thatch management are important in disease management by reducing stress. Fertilize according to a recent soil test. Excessive fertilization and irrigation can lead to thatch buildup, which may favor disease activity. Low mowing heights may also trigger disease onset, and sometimes just raising the mowing height on low-cut putting greens can reduce incidence. Consider soil aerification if soil is compacted, especially in high foot traffic areas around playgrounds and picnic areas. Use of a core aerifier is preferred. Removal of affected patches followed by resodding can also be beneficial if there are only a few small diseased areas within the lawn. Collect and destroy infected plant parts before considering resodding.

Acidic soils tend to reduce the severity of the disease. Do not apply lime to lawns diagnosed with take-all root rot. If soil pH is high (> 6.5), use sphagnum peat moss to lower soil pH. Topdressing with 1 bale (3.8 ft^3) of sphagnum peat moss (pH 4.4) for every 1,000 ft^2 of lawn is most effective in reducing take-all root rot severity. This beneficial reduction of disease from topdressing with sphagnum peat moss likely occurs because the peat moss reduces soil pH. Additionally, ammonium sulfate can be used for nitrogen fertilization since it will also help to reduce soil pH.

Plants grown in soils with low levels of plant available manganese (Mn) have shown an increased susceptibility to take-all root rot. Consult recent soil tests for Mn availability in soils. Arkansas soils with > 10 ppm Mn should be sufficient if soil pH is < 6.5 since Mn is more available at low soil pH. A leaf tissue test will also provide an indication of the level of Mn. Manganese concentrations in leaf tissue should be > 25 ppm (mg/kg). A granular fertilizer containing $MnSO_4$ should be applied (2 lb Mn/acre or 0.05 lb Mn/1,000 ft^2) if there is a deficiency.

Fungicides are more effective when applied as preventatives rather than after symptoms are evident. Fungicides containing azoxystrobin, fenarimol, myclobutanil, thiophanate-methyl or triadimefon are labeled for take-all root rot control and may provide some short-term suppression of the disease. See Extension publication MP154, *Arkansas Plant Disease Control Products Guide*, for products labeled for take-all root rot. However, the efficacy of these fungicides may be questionable and likely will be insufficient to control disease. Since infections are believed to occur in the fall and early spring, fungicide applications beginning in the early fall may be more effective for preventative purposes. Homeowners will need to hire a professional applicator for these applications. Applications should be made in fall or spring per fungicide label recommendations. These materials should be applied with a large volume of water or watered in after application to ensure the active ingredients reach the root zone. Fungicides can be applied only to areas of the lawn typically expressing symptoms in order to reduce the cost of these applications.

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