

# *The Plant Doctor*

## **Take-all Disease of Turfgrasses**

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Ectotrophic Root Infecting Fungi (ERI) live on the outside of the underground parts of plants. They form thick, dark, thread-like strands (hyphae) on the outside of roots, stolons, and rhizomes. We use the term “ERI” to describe these fungi because they are hard to tell apart, even though they belong to very different groups. ERI fungi attack food crops such as rice and wheat as well as turf.

One ERI fungus causes Take-all disease of St. Augustinegrass, centipede grass, and zoysiagrass. Other ERI pathogens may also be associated with the disease, but this is not yet clear. The same fungus also causes a disease of bermudagrass called bermudagrass decline.

There are no published studies on how to help a yard recover from Take-all disease. This publication provides practices that have worked for others or are inferred from other crops the pathogen infects. The information will change as we learn more.

To manage the disease, we first need to understand its cause. The fungus grows along the length of the outside of roots, stolons, and

rhizomes. The hyphal strands are dark and form thick runners.

As long as the plant stays healthy, the fungus stays on the outside of the plant and doesn't cause much damage. When the plant is stressed, though, its defenses are weakened, and it can no longer keep the fungus out.

The fungus forms specialized structures to invade the plant. Once inside, the fungus slowly consumes the supporting tissue of the plant. Affected tissue first turns yellow then dark brown or black, depending on the stage of infection. Roots, crowns, stolons, and rhizomes all may be infected.

The fungus may spread to other areas by contaminated equipment, sod, or rice stalks used for mulch. On rice, the fungus produces sexual spores, which may be spread by wind. You seldom see this stage in turfgrasses.

The fungus grows best at soil pH's higher than 6.0. Soil water levels near field capacity seem to stimulate fungal growth and development but not disease severity. You usually see Take-all decline

begin after wet periods or after some stress factor has affected the turf.

## Symptoms

Symptoms are most common in the summer and fall. Usually, temperatures are in the 80's, and there are often daily rains. Often the first symptom you notice is irregularly-shaped patches of off-colored or slightly yellow turf. The color becomes more noticeable until the turf starts to brown and die. This happens faster in hot, dry weather than in cooler weather. The dead patches start small and enlarge greatly over a few years so that after three years much of the lawn may be affected.

By the time you see the first yellowing symptoms in the turf, the fungus has consumed most roots. So, the first true symptom of Take-all disease is root decay. Roots affected by the disease appear dark, usually black, and rotted. As the disease progresses, stolons also rot, and turf fully affected by the disease does not hold onto the ground. If you grab a handful of the turf and pull on it, it comes out of the ground easily, with only a few blackened roots clinging to the nodes.

Structures called lobed "hyphopodia" are diagnostic of the disease. You must see them to be sure the disease is Take-all and not something else. Black hyphae alone are not enough for diagnosis. Lobed hyphopodia look like a cartoonist's drawing of an amoeba, a deeply scalloped circle – like a large cookie with bites taken from around the edges. You can see them with 20x or higher magnification (hand lens/microscopes) on washed stolons and rhizomes. They are most apparent on St. Augustinegrass stolons.

## Management

Since the fungus apparently does not become pathogenic until the host plant is under stress, eliminating stress on the turf plants is an important part of turf recovery. You should do a complete survey of all cultural practices that cause stress and change any practices that are not best for the turf.

Some common turf stress factors are mowing height, mowing frequency, pH, fertility, herbicides, watering, compaction and thatch. Only brief summaries of these stress factors are provided here, but proper practices for warm season turfgrasses are outlined in Extension publication 1322, "Establish and Manage Your Home Lawn."

The first step in managing the disease is to have a soil test done for each major section of your turf area or lawn. The most important soil layer for pH adjustment is the top four-inches, where most of the plant lives, so take your soil samples from the top four inches.

Manage the pH as acidic as possible for the turf you are growing (see table). All but one centipedegrass sample with Take-all disease that has come through the Mississippi State University Extension Diagnostic Laboratory has had a soil pH very near 6.0. The adaptive pH range for centipedegrass is 4.5 – 6.0. The one exception had low levels of potassium and high levels of other nutrients.

Consult the soil test results to determine the fertility balance and potassium levels. Make sure the nitrogen, potassium, and phosphorous levels are balanced. Lack of potassium makes bermudagrass decline more severe. If you must add a fertilizer, use an acidifying form, such as ammonium sulfate, to keep an acid pH. Avoid nitrate nitrogen. (IS1668 Plant Diseases and Fertilization)

Also consult the soil test for calcium levels. In general, plants lacking calcium are more susceptible to disease than plants with enough calcium.

The fungus immobilizes soil manganese, so spray applications of manganese solutions may help. We don't yet know the best formulation and how often to use these sprays.

Excessive fertility may also trigger this disease, but this is unproven. St. Augustine and centipedegrass were originally selected to thrive in low fertility areas, and some publicized (high) fertility programs may contribute to this disease.

## Mow height and soil pH range for common turfgrasses used in home lawns

Turfgrass	Inches	Acceptable pH range
St. Augustinegrass	2.5 – 3	5.0-6.5
Centipedegrass	1.5 – 2.5	4.5-6.0
Zoysiagrass	1 – 2.0	6.0-6.5

Mowing height differs with turf type (see table). Besides mowing at the correct height, you should think about how often you mow. Don't remove more than  $\frac{1}{3}$  of the length of the turf leaf in any one mowing. This means you should mow shorter turf areas more often than long areas. Low mowing heights often trigger bermudagrass decline, and sometimes just raising the mowing height will greatly reduce symptoms. Frequent mowing at the proper height may very well improve the turf.

Soil compaction limits movement of air into the soil, increases the level of carbon dioxide, reduces soil moisture, and increases runoff. It is harder for turf plants to grow roots in compacted soil. Aerate the turf as vigorously as the roots will allow. The best way is to use a hollow core aerifier. Remove and destroy the cores, and do not fill in the holes. If you apply a top dressing, use a light top dressing high in acid organic matter, say 3 percent peat. Some reports say activated composts are beneficial, but others have seen no extra benefit from them. If you apply a fungicide, this is a good time to do so.

Thatch is an intermingled layer of dead grass stems, leaves, and roots between the soil surface and the green turf. It occurs when the turf decays slowly before dying. A thatch layer deeper than about  $\frac{3}{4}$  inch tends to raise the turf crowns and roots out of the soil, exposing them to high and low temperatures and drought. Many harmful fungi also survive in the thatch layer. You should lessen thatch.

Since the fungus infects stolons, rhizomes, and crowns, most of the fungus population is in the upper turf layer. If you are going to replace the lawn, removing the upper several inches of matted turf debris and soil will eliminate most of the fungus that may infect the next turfgrass planting.

Most warm season lawn grasses are sensitive to different kinds and rates of herbicides. For instance, only a few can be used safely on Centipede grass (consult Extension Publication 1322, "Establish and Manage Your Home Lawn"). Poorly timed applications, or even rates of a safe material applied to a lawn that is already stressed from other causes, such as by moisture, may result in weakened turf, which is more susceptible to disease. Earlier herbicide burns have been associated with lawns suffering from Take-all disease later.

Watering is critical to the lawns health. Proper watering prevents stress whereas over and under watering cause stress. Over watering also encourages growth of the pathogen. Water deeply, so that water penetrates about 4 inches. Do not water again until the soil starts to dry at this depth—unless your roots are so badly diseased that they do not reach this depth. If this is the case, water again when the soil moisture starts to dry around the root tips. You can push an unpainted wooden dowel into the soil to determine the depth of the soil moisture. Moist soil crumbs stick to the dowel, but dry soil won't. See Extension Information Sheet 1670, "Watering and Plant Disease" for more watering information.

Fungicides don't control this disease. The most effective fungicides are members of the strobilurin group whose common names end with 'strobin'. Examples of these fungicides are azoxystrobin (Heritage) and pyraclostrobin (Insignia). Both are very expensive. Azoxystrobin is not available to homeowners without an applicator's license. Studies in other states indicate tridimefon (Bayleton), which is available to the homeowner and is relatively inexpensive, provides some control. If you apply a fungicide as a spray, apply it in at least 2 to 3 gallons of

water per 1000 ft. If a certified applicator applies either azoxystrobin or pyraclostrobin, water it into the root and crown layer after application, unless it has been applied in enough water to move it into the root and crown zone. Usually about ¼" of water is enough. Do not over or under water. You may get best success by first core aerifying the soil, removing the cores, applying a fungicide, watering to move it into the crown of the plant, then top dressing with peat or activated compost.