

Are Etiolated Tillers A Visual Nuisance or Something Else?

By Mike Fidanza, Jeff Gregos and Dan Brickley

Have you ever noticed the distinct, visual appearance of elongated or etiolated turfgrass leaf blades on tees, fairways or greens? In areas where the turfgrass surface is perfectly even and manicured, you might have noticed an occasional leaf blade stretching upward an inch or more above the neatly mowed canopy. The typical etiolated leaf blade has an abnormal appearance of a yellow or light-green color. Incidentally, the term etiolated is derived from the French *etiolier*, which means to grow pale and weak (Salisbury). By definition, etiolation is the growth of shoots in the absence of light or in very low light, which causes stems and leaves to become elongated and also yellow due to the lack of chlorophyll (McMahon).

Etiolated tiller symptoms (ETS) was first coined by Jeff Gregos to describe the widespread epidemic of etiolated and damaged perennial ryegrass in fairways at Lebanon (Pa.) Country Club during 2004 and 2005. At first this condition was a visual nuisance with elongated and chlorotic leaf blades scattered throughout the fairways, but a severe decline in turfgrass quality and disruption in ball roll warranted action.

Lebanon Country Club Superintendent Dan Brickley had to resort to mowing fairways five to six days per week along with an aggressive plant growth regulator (PGR) program to minimize the appearance of those elongated or etiolated leaf blades, which has become an added expense of employee time and equipment wear and maintenance. ETS has been observed in other areas in Pennsylvania and the mid-Atlantic regions, and recent chatter on a professional Web site indicates the appearance of ETS in many other geographic regions of the country.

ETS has been observed in Northern Europe and Scandinavia, and it's called ghost disease in England. Typically, symptoms first appear during late spring to early summer, not as evident or persistent during the summer, and again more pronounced in late summer to early fall. More information is needed, however, regarding specific environmental conditions that are associated with ETS.

ETS can be expressed in different ways. Frequently, only etiolated leaf blades are visible, particularly the youngest or newly emerged leaf blade, with no other turf damage visible. An advanced stage resembles a "melt-



QUICK TIP

Integrated Pest Management (IPM) involves careful consideration of all control methods for the multitude of pests that invade turfgrass or any part of its growing environment. The strongest and most beneficial part of any IPM program includes maximizing turfgrass health above all else. To do our part to respect nature, the environment, the demands of our turf and of our golfers, we do not want to apply short-term remedies to long-term issues of turf health, particularly when it comes to developing a turfgrass stand capable of withstanding any pest invasion. Read about developing the strongest turf at www.floratine.com.

PHOTO 1



Photo 1: ETS (etiolated tiller syndrome) symptoms in a perennial ryegrass fairway.
Photo 2: Etiolated perennial ryegrass leaf blade. (Photos by Mike Fidanza)

PHOTO 2



PHOTO 3



Etiolated perennial ryegrass leaf blade.
(Photo by Mike Fidanza)

ing-out" turf appearance with a combination of etiolated leaf blades and collapse of surrounding tillers thinning out in patches or at random leading, and thus severe and necrotic turf damage. Low light conditions may not be the only reason for ETS, since symptoms have been observed in both shaded and full-sun areas on fairways, roughs, greens, green collars and approaches and tees.

In general, ETS has been observed mostly on perennial ryegrass, creeping bentgrass and occasionally on annual bluegrass. ETS has been observed in turf treated with PGRs, and turf not treated with any PGR.

Upon close inspection, several organisms have been isolated from affected turfgrass: *Fusarium* sp., *Rhizoctonia* sp., bacteria (unknown sp.), *Ascochyta* sp., *Leptosphaerulina* sp., *Dreschlera* sp., and *Pythium* sp. The role these organisms play on ETS is not clear. Recently reported in New Zealand, the appearance of etiolated leaf blades in turfgrass was called "mad tiller disease" (Stewart). Fungi isolated from affected tillers of ryegrass in New Zealand included *Fusarium*

culmorum, *Fusarium crookwellense* and *Rhizoctonia solani* (Stewart). Although these fungi cause foliar, crown and root diseases in plants, many *Fusarium* fungi also produce plant growth hormones called gibberellins (Agrios, Ios). Japanese farmers will occasionally find an elongated rice plant, which they call bakanae or "foolish seedling" disease, where the extended tiller becomes yellowish and necrotic and then dies. In rice, this disease is caused by the fungus *Fusarium moniliforme*, which also is known to produce gibberellins (Desjardins, Sun). At this time, it is unknown if ETS is related to "foolish seedling" disease of turf.

What exactly is the cause of ETS in turfgrass? Several hypotheses are being investigated. The appearance of etiolated leaf blades is most likely due to excessive amounts of gibberellins perhaps accumulating in meristematic plant tissue. This over-production of gibberellins could be the plant's defensive reaction to colonization of xylem tissue by bacterial or fungal species that might or might not be pathogenic to the turfgrass plant. Some bacterial and fungal organisms that potentially are primary or secondary invaders of turfgrass are known to produce gibberellins themselves, which can indirectly contribute to the elongation of the newest leaf blade (Taiz). The relationship of turfgrass maintenance practices and ETS is also being investigated. Should this condition be labeled a plant disease, or is this some plant physiological disorder?

Research is needed to answer these questions.

What can be done to control ETS or mad tiller symptoms in turf? Even though the exact cause of ETS is not decisively known at this time, fungicides and plant growth regulators commonly applied to fairway turf in summer maintenance programs have been evaluated in field studies in 2004, 2005 and 2006. The objective was to evaluate any potential association with ETS and plant protection products, including fungicides and PGRs.

Note: Fungicides and PGRs are not labeled for the management or control of etiolated tillers in turfgrass. The field studies were con-

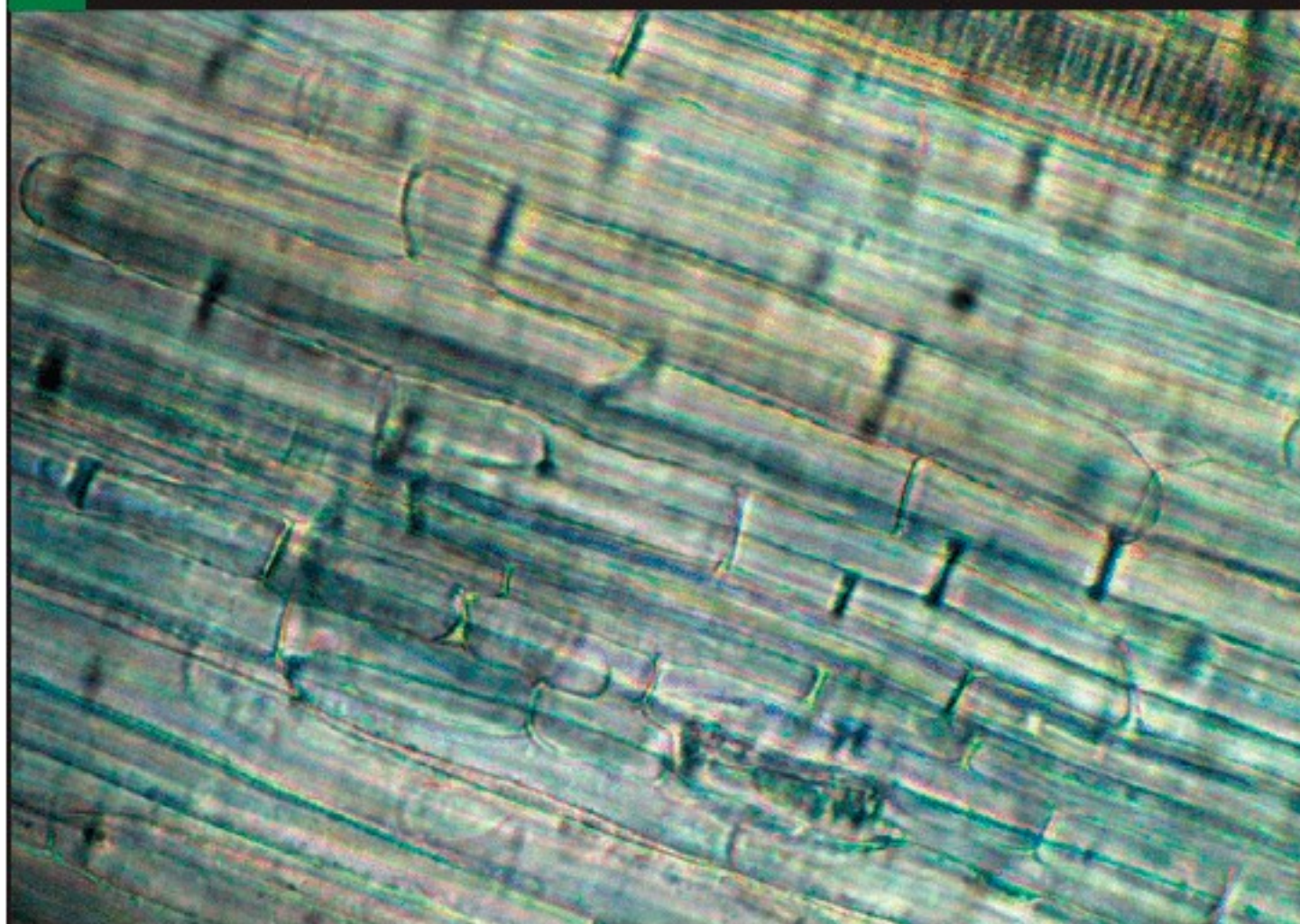
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QUICK TIP

The EPA's list of Integrated Pest Management (IPM) principles does not reference fertilizers, but rather focuses only on insects and diseases. However, the IPM guidelines can also be applied to fertilizers. Unnecessarily over-applying fertilizers can be compared to the unwarranted application of an insecticide when pest populations are too low to affect turf quality. As with pesticides, leaching caused by excessive fertilizer use is an environmental concern. Therefore, proper judgment must be used to determine if the plant requires a fertilizer application. Soil and tissue testing are useful tools that can help you make these critical fertilizer decisions.

PHOTO 4



Microscopic view of elongated cells from an etiolated perennial ryegrass leaf blade. (Photo by Jeff Gregos)



Bayer Environmental Science

QUICK TIP

Put *Poa* in its place this fall! Prograss herbicide eliminates *Poa annua* in perennial ryegrass, Kentucky bluegrass, creeping bentgrass and turf-type tall fescue. Because rates and number of applications vary with the tolerance of the desirable turfgrasses, superintendents should gain experience with Prograss by testing selected areas before application. Remember: Turf at its optimum level of fertility better tolerates Prograss, allowing desirable grass to fill in when *Poa* is controlled.

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ducted on a perennial ryegrass fairway with a history of ETS at Lebanon County Club. In 2004 and 2006, the actual number of etiolated tillers were counted per plot. In 2005, an estimate of the percent plot area affected with etiolated tillers was visually determined due to the severe amount of etiolation.

Overall, a noticeable reduction in the visual appearance of ETS was observed in plots treated with fungicides that contain an active ingredient of a demethylation inhibitor. A reduction in ETS was also observed in plots treated with the PGR products, which were only included in that 2005 field study.

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Most all other fungicides tested had no effect or influence on the incidence of ETS in those perennial ryegrass field studies.

Although a few plant protection products show promise for helping to manage ETS, the cost of using those products could be a challenge to golf course superintendents. Therefore, more field testing and plant physiology-based greenhouse and laboratory research is warranted to fully understand ETS in turfgrass. For now, the cautious use of PGRs with frequent mowing helps to minimize the visual appearance of ETS, especially those elongated leaf blades.

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