Ghost grass

Jonathan Knowles enters the spooky world of ghost grass

The Ghost Grass Disorder is observed by many turf professionals and can raise a few questions.
Is it a passing phenomenon, or, is it an indication of something a little more sinister? It can be identified by the elongated chlorotic (yellowing and whitening) leaves that rise significantly above the surface canopy by around 10 – 25 mm (Plate 1).

This disorder is mostly commonly observed on maintained and closely mown areas including greens, tees and fairways.

With similarities to some diseases it is worryingly at risk of misdiagnosis, costing time and potentially expensive pesticides, conditioners and fertilisers that ultimately have no effect, or possibly exacerbating the effects.

The disorder is not widely researched in UK turf.

In the UK it is mainly referred to as 'Ghost Grass'.

In the United States there are two names used, some refer to the disorder as Mad Tiller, however, since around 2005 it is routinely named by experts as Etiolated Tiller Syndrome (ETS).

The cool-season grasses that are readily named as susceptible to ETS are mainly reported as:

Annual Meadowgrass (Poa annua), Perennial Ryegrass (Lolium perenne), Creeping Bentgrass (Agrostis stolonifera) and Smooth-Stalked meadowgrass (Poa pratensis).

Etiolation

To get a better understanding, it is perhaps important to understand the lay-definition of the phenomenon called - etiolation.

With the absence of prolonged daylight to leaves a physiological differentiation occurs to plants such as grass.

The leaf cells elongate and the chlorophyll loses its green pigment in response to diverting energy into avoiding the darkness by competing or searching for light.

Of course, in many situations where ETS occurs on the golf course, shade and restricted light may not be obvious from overhanging branches or shadows from tall trees.

The conditions of warm overcast periods; with flush growth followed by wet and cold; with the shortening daylight periods raise the competition for sunlight within a dense sward.

These environmental and surrounding microclimate conditions are considered a contributory factor.

During etiolation, infected plants are observed as having an increase in gibberellins.

Gibberelin

The plant growth regulator gibberellic acid stimulates vertical leaf growth by elongating the cells in maturing grass plants.

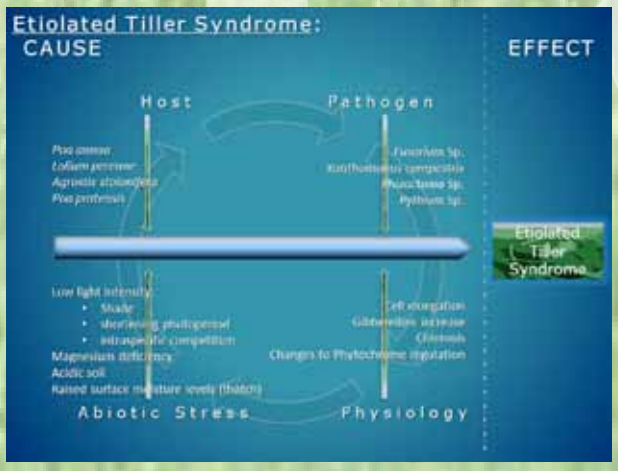
Applied gibberellic acid is known to increase shoot growth, while reducing root growth and overall turf quality.

Gibberellins are synthesised during germination in grasses and cereals specifically.

However, the application of gibberellic acid to seed does not increase germination.

Etiolation can be the result of a number of abiotic factors, such as shade, but also an array of biotic factors, such as bacteria.

Some experts suggest this rapid



production of gibberellins with excessive foliar growth is caused by pathogens such as, Fusarium Sp.

Gibberellins were first discovered in the 1930's by Japanese scientists investigating the pathogen Gibberella fujikuroi which causes the fungal disease Bakanae in rice.

Many fungal diseases are now know to increase gibberellins, including the large genus of fungi - - Fusarium.

It is important not to confuse this with Fusarium Patch, which is associated with the pathogenic fungi Microdochium nivale.

The Fusarium pathogens causing ETS are from a different genus of fungi for example, Fusarium acuminatum, F.graminearuma and F.heterosporum.

The Causes of Etiolated Tiller Syndrome

The cause and effect of ETS is depicted in Figure 1, the four causes are illustrated as; host, pathogen, abiotic stress, and physiology.

With each of the four causes are listed examples which may be observed during the effects of ETS.

Not all the listed have to be comprehensively observed to give rise to ETS.

For example, not all the host species need to be in the sward, not all pathogens have to be active and not all the abiotic stresses need to be observed.

In principle Figure 1 exemplifies a management tool for controlling ETS, by potentially breaking the known association between the causes.

Managing Etiolated Tiller Syndrome

Similar to other diseases and disorders a threshold will activate the turf manager's action.

If the occurrence of ETS is of little consequence to playability, maintenance and appearance, then management is limiting in disruption, and will often call for increased mowing and continued monitoring.

However, going above the threshold for tolerance may see the significant effects of ETS; this will need management and control.

The control of ETS as with other cases of disease and disorders should be pro-actively managed with cultural approaches.

A cultural approach to disrupting the associated causes would be to culturally manage the abiotic stresses (with the exception of photoperiod (day length)).

A dense sward should never be a mono-culture, as culturally speaking an intraspecific competition for light will always be stronger in a mono-culture as growing patterns are matched.

Also, a mono-culture has the potential for spreading diseases exponentially until the carrying capacity is maximised – this could be significantly detrimental.

It is understood that the susceptibility varies between species for ETS, so a blend of the susceptible species will be culturally more acceptable in comparison to the mono-culture.

Clearly, to introduce non-susceptible species to the composition will reduce incidence and further damage.

Managing the low pH and the nutrient deficiencies may hold an additional control.

Lowering the soil pH by the over application of ammonium sulphate is related to diminishing magnesium ions, this is bad news and an invitation to ETS.

As magnesium is required for chlorophyll production, any observed chlorosis, could be an indication of a magnesium deficiency, and should be investigated.

The application of Magnesium in the form of Epsom Salts has been shown to control ETS in the UK.

Possibly the most important cultural control is the cultural control that should be embedded in every turf managers mind – aeration.

It is a simple and distinct fact that such diseases do not spread on dry turf.

Essentially, keeping the turf environment dry and firm will limit disease incidence and improve turf health to cope with these stresses.

International research has investigated the application of Trinexepac-ethyl and ethephon (Primo-MAXX and PROXY) for ETS, while the outcomes are sketchy, as the application of Trinexepac-ethyl is suggested as a logical control because of the inhibiting effect on gibberellic acid.

However, there are experts who have observed ETS on areas under routine applications of Trinexepac-ethyl.

Further research is needed.

A broad spectrum strobin fungicide could perhaps, pose as a possibility, it must be said that strobins e.g. azoxystrobin or pyraclostrobin are not known or labelled as a control for ETS, but they offer a unique systemic mode of action through the xylem tissue and attack many pathogens.

Again, further research could be investigated here.

Beware of misdiagnosis

The misdiagnosis of ETS for the Yellow Tuft (Downey Mildew) disease is plausible because of the chlorotic etiolated leaves.

Yellow Tuft patches are raised patches similarly seen with ETS.

Yellow Tuft effects bent-grasses alone, which, once infected are easily extracted from the turf and are defined circular patches.

Whereas the etiolated leaves associated with ETS can be see across the turf in an irregular formation, especially on P.annua swards.

While the cultural control will be much the same for Yellow Tuft as ETS, diagnosis should always be clarified in order for effective monitoring and management.

In summary

Etiolated Tiller Syndrome could be regarded as a passing manageable phenomenon.

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Ensuring any practices to lower the soil pH are monitored and considered a risk towards a disorder such as ETS.

A mono-culture sward should be addressed and renovated to enhance a multi-cultural one.

The turf environment must be maintained as consistently dry and as thatch free as possible.

ETS could be best described as an 'Indicator' of future problems, as a mono-culture (especially of Poa annua) with a dense thatch, that is sustained with excessive applications of acidifying fertilisers, will always be detrimental to the turf environment and ultimately the playing surface at some point.

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about the author

Jonathan Knowles has been involved in Greenkeeping for 18 years, first as a greenkeeper and latterly at Myerscough College. Recently he has been working on a research project that discusses the effects of cutting height on the grass species in golf greens and the associated trends for adapted ecological methods for greenkeeping.