

Fact or Fiction?

Dr Kate Entwistle, The Turf Disease Centre, gets under the microscope to explore new turfgrass diseases and asks if they really exist.

To answer the question as to whether new turfgrass diseases are really developing, it is important to be clear what is meant by the term new diseases. You could reasonably argue that if a known pathogen - an organism that has the potential to cause disease - causes symptoms of disease on a turfgrass that has previously not been known to succumb to that pathogen, the result is actually a new disease.

This might be the case with the new grass types that are being developed for use or the introduction of non-native grasses in to our amenity areas. Personally, I would argue that a new disease is identified only when a previously unknown or unidentified pathogen is formally identified and associated with the expression of disease symptoms, regardless of the grass that is being affected.

As an example, it has become increasingly common over the past few years to find take-all patch developing on *Poa annua* swards but, since the pathogen has long been known to have the potential to infect *P. annua* even though the occurrence of its infection had been relatively uncommon, I would not say that this is a new disease - it is still take-all patch.

We tend to use common names for diseases because the Latin names of the organisms that cause them can sometimes be quite difficult to pronounce. For example, it is easier to say that your turf has take-all patch than it is to say that your turf is infected by the fungus *Gaeumannomyces graminis* var. *avenae*. However, the use of common names can occasionally be either misleading or amusing.

To say that your turf has fusarium means something completely different to saying that your turf has fusarium patch and one of the turf diseases that I love to hear about is anthrax. Of course, common sense tells us in 99% of cases, what is really meant by what is said but for that small number of cases where there may be confusion, naming the organism rather than using the common name for the disease dismisses any doubt.

SO HOW DOES THIS RELATE TO THE DEVELOPMENT OF NEW DISEASES?

For those of us who have a passion for turfgrass diseases, we are always studying the symptoms of damage on turf to try and find any association with a given pathogen. It is always the symptoms of disease that are recognised first and once the symptoms have been recorded or described, the search is on to find out if those symptoms have been caused by a pathogen and if so, is it one that we know about or something new.

Take-all patch is again a very good example of a disease where the symptoms had been recognised and recorded across the United States between 30 and 50 years before the causal fungus was confirmed.

Obviously, pathologists are always hoping that observed symptoms will be the expression of a new disease but in most cases, we have to admit that the unusual or uncommon symptoms are merely a different expression of a well known pathogen. Very occasionally, something exciting is found, 'a new disease' but getting it accepted in the Industry can sometimes be an up hill struggle.

This is something that I have always found difficult to understand. If we think back to what was known about turfgrass diseases only 60 years ago, the diseases recognised then did not include several that are generally accepted today.

There must have been a time when the symptoms that were continually being seen on the sward were eventually associated with a specific causal organism and a new disease was described. That must have happened in the past, so why should it not still happen today?



Fusarium Patch



Take-all Patch

Staying with the example of take-all patch disease, the causal fungus *G. graminis* var. *avenae* is referred to as an ectotrophic root infecting (ERI) fungus and up until as recently as 1984, it was the only recognised turfgrass disease that was caused by an ERI fungus. Today, there are six.

As recently as 1998, researchers in the US discovered a new disease of creeping bentgrass caused by the ERI fungus *Ophiosphaerella Agrostis*, a new species of this fungal genus (Camara et al, 2000). They initially gave

the disease the common name bentgrass dead spot but following identification of *O. agrostis* causing dead spots in hybrid bermudagrass greens, the common name was changed to dead spot (Kaminski & Dernoeden, 2004).

It should be mentioned that there are presently two other as yet unidentified diseases that have recently been recorded on bermudagrass putting greens. One is tentatively being referred to as 'mini-ring' and the other, 'unknown bermudagrass disease but not the min-rings' (O'Brien, 2005). Research is currently ongoing in the US to try and confirm the identity of the fungi causing these symptoms.

We have already identified one new disease to the UK and Ireland but its identification appears to remain a difficult one to accept by many in our industry. The disease in question is that of the yellowing patch disease caused by the new species of root-knot nematode, *Meloidogyne minor*.

It was in 2001 that this nematode was independently identified by both myself and Dr Joe Vargas, of Michigan State University, as the cause of the disfiguring symptoms of yellowing rings and patches on creeping bentgrass greens. However, it was only in 2004 that this new nematode species was formally described in a publication by Karssen et al.

Plant parasitic nematodes like *Meloidogyne* are, quite correctly, described as disease causing organisms since they directly attack and colonise the plant and cause changes to the normal physiology or functioning of the plant. They affect the plant in various ways including direct injury to the plant cells, secretion or injection of enzymes and other toxins into the plant or by forming specialised feeding sites that physically disrupt the normal function of the plants vascular tissue.

We now know of several nematodes that are associated with damage to cool season turfgrasses and in particular the nematode *Subanguina*

radicola that causes galls on the roots of *Poa annua* in putting greens. Although there is now substantial evidence to support the theory that plant parasitic nematodes can cause, or significantly contribute to, disease problems on cool season turfgrasses, they are still dismissed by many as having any part to play in observed disease symptoms.

We have seen that there are new fungal diseases of bermudagrass being investigated and also new nematode diseases recorded on cool season turfgrasses, but are there any new fungal diseases of cool season turfgrasses?

Absolutely. I have already mentioned the dead spot disease recently identified across the US but there is another that is still in the process of being formally identified. In 2004, Patrick O'Brien and Christopher Hartwiger (USGA Section SE Region) wrote a regional update, on the USGA website, detailing an unidentified bentgrass disease that was impacting the Southeast region.

The disease was known to attack the root system and upper leaves of bentgrass eventually causing total dieback of the plant. In April of this year, I received a copy of an article from Dr Lane Tredway, written for publication in USGA Green Section Record (Tredway & Kerns, May/June 2005), in which they describe their current theory regarding this new disease.

They believe that this widely distributed disease is a *Pythium* root dysfunction caused by *Pythium volutum* and details of this new disease along with pictures of the damage, can be found on the USGA website. So there you have two new fungal diseases developing on cool season turfgrasses but I hear you shout, they are in the US. Do we have any new fungal diseases on this side of the pond? Well yes and no - let me explain.

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Close up of turf affected by rapid blight disease, note healthy fescues

NEW 'FUNGAL' DISEASE IN THE UK

Back in August 2004, I received a telephone call from a Course Manager who told me that he had noticed an unusual disease on his greens and the symptoms looked like a cross between take-all patch and fusarium patch. He was concerned enough to want to find out the cause of the strange symptoms and I was excited by the 'unusual' description of the problem and couldn't wait to look at a sample of the affected turf.

The sample duly arrived at my lab and the turf showed water soaking of the bentgrass and meadowgrass in the sward, but not the fescue that appeared completely healthy. Commonly, water soaked plant tissues could be associated with fungi like *Microdochium*, *Rhizoctonia* and *Pythium* species, but none of these were found either on the leaf or in the root or crown tissues.

In fact, there was no fungal mycelium evident on the sample at all. Analysis and investigation of this apparent disease, which included sending photographs to researchers in the US of the organism that I eventually found in the affected plant tissues, ultimately concluded in confirmation of the disease known as rapid blight - previously but mistakenly called Chytrid disease.

Rapid blight is a turfgrass disease not previously recorded in the UK - a new disease! The organism that causes the disease rapid blight is a *Labyrinthula* species and strictly speaking, *Labyrinthula* are not fungi. This disease was initially seen in California, in 1995, (Martin et al, 2002) but it wasn't until 2004 that details of a new species of this organism, *Labyrinthula terrestris* sp. nov., were published by Bigelow et al. which confirmed the cause of these symptoms. Therefore we definitely do have a new disease on turf in the UK but it is not strictly correct to say that it is caused by a fungus.

The organism *Labyrinthula* is unique and although it is often referred to as a marine net slime mould, it is still being formally classified. It is currently placed in a group alongside the Oomycetes, a group which contains *Pythium* and since we commonly refer to *Pythium* species as fungi I don't see why we can't do the same for our *Labyrinthula*, especially in informative articles like this where it is the symptoms and the management that are of primary concern, rather than the taxonomy of the organism.

Other diseases of cool season turfgrasses that you may want to look out for include grey leaf spot and summer patch. These are now well known turfgrass diseases in the US and across Europe but not in the UK and Ireland - yet.

I am certain that disease problems are misdiagnosed on our golf courses and with the difficulty of being able to identify certain fungi in older turfgrass samples, the same is also potentially possible in the lab. We do have the fungi over here that have been implicated in disease problems elsewhere around the world but confirmation of the link between the pathogen and the disease has, as yet, not been achieved.

As with the case of the rapid blight, we are reliant on information and turf samples from Course Managers who are interested enough to ask questions about the expression of disease in order to identify new problems. There is certainly no shame or stigma attached to having a previously unidentified disease on your course and it is only through your direct involvement that we will ever know what disease problems are really out there on our courses. If you see symptoms that appear slightly different from those you normally expect to see, take a sample out and have it analysed.

Pathogens are as much a part of the turfgrass environment as they are any other part of the natural world and in turfgrasses, as in all other areas, new diseases will be continue to be discovered. I firmly believe that there are other turfgrass diseases waiting to be found and named and that with time, they will be.

HOW DOES THIS AFFECT THE WAY THAT YOU MANAGE YOUR TURF?

Well, for most turfgrass diseases, the symptoms only appear when the conditions allow the pathogen population to become overwhelming. The fungal population will eventually decrease with changes in the environmental conditions, the symptoms will subside and all traces of the damage will be erased as the turf recovers.

This is the case for many diseases, regardless of the name that you give them, but if you correctly identify the cause of the symptoms, you can learn more about the conditions that favour the development of that particular pathogen. In knowing that, you might well be able to prevent the problem, or at least reduce the severity of its impact, in subsequent years.

I have always been fascinated by the interaction between fungi and plants and I can think of nothing more rewarding in my professional life than to identify a new disease. Confirmation of the new disease rapid blight will be published as a new disease report in *Plant Pathology* later this year (Entwistle et al, 2005) - will the next new disease be found on your course?

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