



Dr Kate Entwistle continues her regular series in Greenkeeper International by looking at leaf spot diseases

Spot the difference

I would bet that if you were asked to name a handful of turf grass diseases, leaf spot diseases would not be among them. Diseases such as fusarium patch, red thread and take-all patch would almost certainly figure in your selection, not only because they are frequently seen on highly managed turf, but also because they are some of the most talked and written about cool-season turf disease problems. Brown patch and pythium diseases may crop up too because they are either frequently identified, or rather misidentified, as causing damage on cool-season turfgrasses or because their effects are so dramatic on the sward that once seen, they are never forgotten.

Below: Close-up view of red leaf spot on a bentgrass sward
Photo courtesy of Grass Science



How important are leaf spot diseases?

Once brought to mind, you may argue that their effects on turf are generally quite minor and therefore not of any great concern. Some of you may consider that because you have never noticed them on your course that they are not of any great importance. Alternatively, you may never have heard of them at all. Although I can understand each of these views, it is a fact that leaf spot diseases can cause a range of symptoms on all turf grasses throughout much of the year and under all management conditions. The fungi which cause them are diverse and differ markedly in their requirements for optimal growth. Their effects on the sward will vary from a virtually insignificant marking of the leaf blade to complete death of the grass plant. These fungi are active now and some leaf spot causing fungi will be active until the autumn and possibly year-round in milder climates.

The term leaf spot encompasses a

whole range of diseases caused by numerous different fungi, but they all have one feature in common - they all produce a defined, often discrete, mark on the leaf blade. The fungi that cause leaf spot diseases may not limit their attack to the lamina, indeed some are so aggressive that they can develop in to the crown and root systems of the plant causing its complete death. Some fungi that are responsible for leaf spot diseases can also kill seedling turf before the plants emerge from the seedbed and these pre-emergence diseases can account for large areas of poorly establishing turf. Mature turf does not go unaffected by leaf spots either and in some cases, it appears that the mature sward is often more severely affected by certain leaf spot pathogens than an equivalent younger sward. There appear to be few rules in this 'disease contest'. Basically, all grasses are affected by at least one leaf spot fungus and the severity of the disease development is a complex formula that deserves a closer look.

Information on turf disease outbreaks

Thank you to all of you who have responded so far to my request for information on turf disease outbreaks. I intend to collect information throughout the year on turf disease problems, so you can offer your information at a time to suit yourself. If you would like to contribute your information, please ask for a form from either Scott (at BIGGA) or myself. The details of your Club will not be published but are requested so that we can identify the location of disease outbreaks. Thank you.

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Above right: Ryegrass variety trial showing cultivar susceptibility to foliar disease. Photo courtesy of Brian Clifford, Novastara

Below: General view of red leaf spot on a bentgrass sward. Photo courtesy of Grass Science



What size are leaf spots?

How long is a piece of string? Many factors affect the size of the leaf spot, not least of all the width of the leaf blade. Grasses with a broad lamina may show individual leaf spots of around 5 mm diameter whereas grasses which have a more needle-like lamina may show comparatively smaller symptoms, even down to a fine 'dot-like' appearance to the leaf blade. Individual leaf spots may well increase in size from their first appearance on the plant and many will coalesce to increase the total area covered by the disease symptom.

What do they look like?

Leaf spots will vary in their appearance depending on which fungus has caused the symptom to develop and which grass the fungus has attacked. Some leaf spots will appear as no more than a pinprick in size and may well be dark brown or very dark red in colour. Other leaf spots will show, for example, a tan circular mark on the leaf that is bordered by a ring of dark coloration and possibly surrounded by a yellow halo. Leaf spot symptoms that are caused by any one fungus, may well change over time. The initial infection of a leaf caused by one fungus may start as a small dark spot but with time, may develop into a more complex and extended symptom which may in no way resemble the initial one. Some plants, when infected by a leaf spot fungus, show a general yellowing or browning of the leaf blade from the tip downwards and this symptom may well be more obvious than discrete spots on the leaf. If the sward looks 'off-colour', particularly following irrigation during the summer months, it is possible that a leaf spot disease is affecting the turf. In short, there is no definitive symptom expression and the only way to be entirely sure which fungus is responsible for the disease is to have it identified in the laboratory.

Why do leaf spots develop?

In order to survive, some fungi use the nutrients within plant cells for their own growth and development.



The disease symptoms that they cause fall into four main types: foliar blights, wilts, root and crown rots and leaf spots. With regard to leaf spot diseases of turfgrass, the exact way in which the symptom is expressed will vary depending upon the specific interaction between the grass and the fungus. However, it is possible to generalise and simplify this process to give an idea of why these symptoms develop.

If we start from the point where the fungal spore is on the grass leaf, we can follow the process of events leading up to the expression of the leaf spot symptoms. Initially, the spore germinates and the fungal hypha enters one of the cells of the plant leaf. Once inside the plant, the aim of the fungus is to obtain sufficient nutrition to sustain its growth and development for as long a time as possible. The plant will try to prevent the fungus from leaving the first cell that it has entered, thereby preventing further damage to itself. And so the battle begins! If the plant is fairly resistant to the given fungus, it will immediately recognise its presence and act so as to prevent the fungus from moving out of that first cell to any adjacent cells. The plant does this in one of two ways. Plants are able to either initiate the death of the cell which has been invaded by the fungus, thereby killing the fungus now inside it, or they can lay down a barrier around the infected cell through which the invading fungus is unable to pass. In this second situation, the effects on the leaf may be nothing more than a small pinprick sized dark mark on the leaf that would probably not be seen unless you were to look extremely closely. However, this response does not always occur. In many cases, either the plant is slow to react to the

presence of the fungus or the fungus is able to produce chemicals that 'fool' the plant so that the plant doesn't realise that it has been attacked. In these cases, the fungus is able to move out of the initial cell that it penetrated and into the adjacent cells. If the fungal presence has still not been 'recognised' by the plant, it is free to move out in to the next band of cells and so on. Eventually the plant realises what is happening and lays down a barrier to prevent the further spread of the pathogen. The longer the fungus has to invade subsequent cells, the larger the resulting leaf spot will be. If large leaf spot symptoms develop, it means that either the plant is slow in recognising the presence of the fungus or the fungus is able to move rapidly through the host plant tissues. Either way, the plant is showing an increased susceptibility to attack.

In some cases, the plant 'over reacts'. It recognises quite early on that it has been attacked and produces chemicals to prevent further movement of the fungus but, even when sufficient chemical has been produced and the fungus is well contained, the plant continues to produce the chemical. Leaf blades can be turned almost completely purple by this panic attack by the plant (as shown in the two photographs of red leaf spot on bentgrass). This over reaction will reduce the possibility of further attacks by the same fungus but, at the same time, will reduce the vigour of the sward by affecting the plants photosynthetic ability. It's a trade off - the plant will recover well from this given time, but it may take a little longer to do so. It has, however, succeeded in stopping the pathogen from attacking and causing a potentially serious infection of its tissues.



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Does the sward height affect leaf spot development?

Absolutely. In general, turf grasses that are maintained under close mowing, show significantly higher levels of disease when compared with the same grass that has been subjected to a less severe cutting height. This effect is dramatic and demonstrates very clearly how our management programmes may contribute to, or be used to reduce, the severity of certain disease pressures. Why should closer mown turfgrasses be more severely affected? There are two main reasons for this. Firstly, once the environmental conditions are right for the fungus to cause damage to the turfgrass, the fungus will enter the plant and initiate the plants reaction. With a small leaf surface area available, a relatively small number of fungal infections can quite easily cover the whole of the leaf blade. If the height of cut was raised, the leaf blade would have a larger surface area and the same disease pressure (number of infections formed in a given time) would cause correspondingly less severe effects on the plant. As the plant responds to the infection, the ability of the plant to photosynthesise is reduced. If the plant has a small leaf surface area to start with (ie under close mowing), the effect of the disease, which effectively reduces the healthy surface area, will have a dramatic effect on the ability of the plant to photosynthesise. As this ability is reduced, the plants food supply is reduced and the plant is put under further stress. While under this additional stress, the fungus now has an even greater opportunity to colonise the turfgrass plant and to cause even more damage. Many swards affected by leaf spot diseases are affected as much by the resulting stresses experienced by the plants as by the initial disease outbreak.

Does cultivar selection matter?

Yes, quite significantly. If you take any one leaf spot fungus and determine its effect across a range of cultivars of the same grass type, you will see dramatic differences in the extent to which the cultivars are affected.

The effect will range from virtually no observable infection to severe attack with significantly discoloured leaf blades and an overall decline in the vigour of the sward. Given the same fungus and the same cultivars, the observed effect will vary depending on the prevailing environmental conditions and the quality of the sward prior to attack.

To summarise...

Although leaf spot diseases are numerous and are not uncommon on cool-season grasses, it is perhaps fair to say that they generally express only minor symptoms on fine turfgrass swards. Occasionally though, they can cause dramatic effects and even the eventual death of the sward. The symptoms expressed depend on the sward composition, its quality at the time of the infection and the specific fungus present. Significant control can generally be achieved by relieving the stress on the turf either by increasing the height of cut or ensuring adequate but not excessive nutrition. As with all diseases of turf, accurate control measures can only be provided following an accurate identification of the cause of the problem.

Many physiological problems associated with turf can produce symptoms that closely resemble the symptoms of leaf spot disease. Make sure that you know exactly what you are trying to control before you implement any control options - it could save you time, money and your sward.