Growing days

An holistic view of growth in turf and soil health is central to stress management in turfgrass and to good integrated pest and disease management, writes agronomist **Noel Mackenzie**

Anthracnose is a classic stress-related disease of Poa annua, usually seen in late summer / early autumn

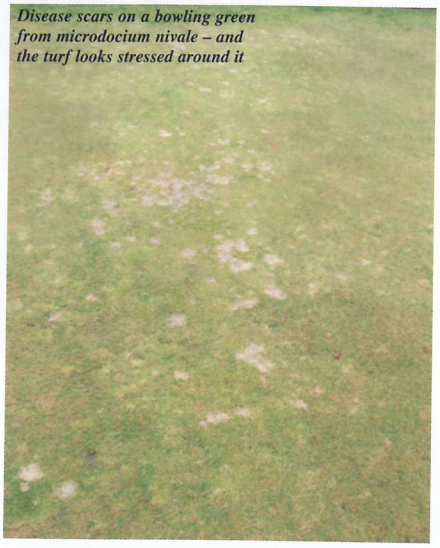
Fortunately, the risk of severe disease attack is now fading, but it is not totally eliminated. The weather should soon be warming and longer daylight hours will increase the ability of the plant to photosynthesise to produce energy, which in turn fuels the protein synthesis process to allow growth in the plant. So now that it's heading towards spring, does that mean you can forget about doing any maintenance work other than to plan to keep up on your cutting when growth arrives?

'Growing days' have been known about for a long time and are the accumulated days where air temperatures are sufficient to allow growth to occur, generally air temperatures in the 15 to 25°C range are optimum, though growth can be observed below 10°C if night time temperatures are not too low. Clearly this is one avenue that greenkeepers could look to consider when selecting fungicides. If growing days are forecast then the use of systemic fungicide will therefore be appropriate, allowing the active ingredient to get inside the plant. If temperatures are too cold and fusarium patch (microdochium nivale), or any other disease, becomes active, then the application of systemic would be pointless thus allowing the greenkeeper to select a contact fungicide in cold conditions to reduce disease impact.

Growing days are therefore an important indicator of when plants (and insects and diseases for that matter) may begin to grow on your course. Most greenkeepers are familiar with the problem of differential growth that occurs most spring times when colonial bent grass begins to grow well in advance of the Poa annua. Each species has its own growing point and clearly it is a fair bit lower for colonial bent grass in a green than it is for Poa annua.

Cold soils are less biologically active than warm soils because basic metabolic processes decline the lower the temperature becomes. If your plant has to grow in cold soil its growth will be limited by conditions. We know that water is a substance with a high heat capacity, which means it will need a lot of heat to raise the temperature of a given amount of water. Perhaps it is possible to see where I am leading this point? Some golf greens are a very sandy construction, such as the USGA, California construction types (not to mention the courses in which the greens already had this type of construction due to natural soil types, that is links and heathland courses). On greens, and other surfaces, with this soil type the soil warms more quickly because they are freer draining and maintain less water in the soil as a result of lower capillary tension to the soil particles (unless ground water levels are so high as to saturate a soil profile). Greater pore sizes fill with air, not water, which warms more easily. Furthermore, greater air filled porosity allows atmospheric gas exchange with the soil, thus transferring heat too.

However, the majority of courses in the UK (and perhaps further afield) are built on soil based greens. Some soil based greens are on fairly sandy loam soils but the majority I see are built on clay or silty clay soils. Where these types of greens have been drained properly (only occasionally the case) the free draining water can escape under gravity's influence, but that water which is held onto the soil particles at a capillary tension higher than gravitational drainage can remove will remain. Some may remember attending soil science seminars and being handed a block of clay that was solid – yet it still retained 90 percent soil water – it's just that this water cannot be removed as it is held on to the soil particles by massive



Disease scars on a bowling green from microdocium nivale – and the turf looks stressed around it

colloidal attraction to the clay particles. As a result of the high water content a cubic metre of clay rich soil would also take more heat to warm it than a cubic metre of sandy rootzone. Conversely the clay soil also cools more slowly than the sandy one. Optimal soil temperature for root growth is around 10 to 18°C.

Why is this important for greenkeepers to consider? The warmer rootzone becomes metabolically active far sooner due to two things: oxygen and warmth. On a soil situation the availability of oxygen is limited in many instances and the soil is colder. The soil is home to countless millions of bacteria and fungi and these are entirely dependent on warmth to function well and generally require oxygen to be efficient in the processing of nutrients within nutrient cycles and decomposition. The warmth of the soil and its biological activity could have significant implications in relation to management choices such as:

- When shall I reduce / increase height of cut and frequency of cut?
- What fertiliser active ingredients should be used? Should these be ones that give a quick input of nitrogen or other elements, or one that can be broken down to slow nutrient release?
- When to apply pesticides / fungicides?
- When to aerate and with what system?
- Overseeding timing.
- Verticutting commencement and intervals.
- Renovation timing and severity.
- Top-dressing commencement.
- Irrigation practices.
- Biological treatments.

The issue in spring will be the matter of how quickly things warm up. But at the end of the year it might also be the case of how quickly things cool down. At this time aeration may be a key consideration in helping to keep rootzones warm. There is the potential for chill effects on turf to occur following aeration. One of the classic times to see this is in the spring following over-adventurous spring hollow tining.

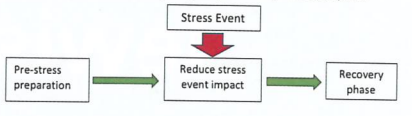
All of the issues highlighted above will have a profound impact on turf health. We maintain turf on the cusp of annihilation. The harder we push the grass the easier it is to tip it 'over the edge' because we have reached the 'point of no return' biologically.

We can relate this to another area where stress management is important: athletes. Most athletes train to very vigorous standards to reach peak condition. However, they do not stay at a 'peak' condition indefinitely. Usually peak condition is followed by rest or reduced / altered training to avoid the body becoming sick or injured. Good greenkeepers know this pattern, they'll push a surface to its utmost for a competition or event but the minute it's over they can back the intensity of the maintenance off and bring the surface(s) out of stress and allow recovery. This is crucially important in grass plants because we shave off so much of the leaf area there are times when the plant is sustained by a proportion of rootmass. If this time period is too great the plant will not survive as its resources deplete and cannot be replaced by stores of energy and nutrients from the root system. The harder the plants are pushed into a 'resource debt' and the more stress they endure, the less it takes to force them into death. For this reason I get very annoyed with clubs that compare their play speed of greens to a neighbouring course that is prepped to 'peak competition' performance – it probably causes more trouble and heartache than anyone realises at committee or pro level!

Therefore it holds that if you want healthy turf there are some things to bear in mind:

- Grass can only take so much stress, especially under inclement conditions during the forthcoming growing season.
- The harder the grass is stressed, the more the plants will be weakened. When the plant comes under stress its immune system will also be affected and it will therefore be more likely to be affected by disease. Greater use or constant use of fungicides should be considered a warning that the grass is under too much stress.
- Stress can occur above or below the surface of the soil. If the turf seems lacking in condition and suffering from ill health, check soil conditions too. Rootzone surfaces and those with high sand volume top-dressings have greater tendency to issues such as nematodes and other soil born pests such as leather jackets (Tipula sp.) more than soil based surfaces perhaps. Regular checking for any sign of problems is therefore essential.
- Make sure that the soil is healthy so that nutritional pathways to the grass are available.
- Avoid practices that can dramatically reduce root system mass and depth of penetration such as excessively low cutting, mechanical stress, and so on, in the summer months.
- Do undertake practices that stimulate rooting at key times, especially late summer / early autumn when the plant is laying down reserves for the winter time. I would recommend not undertaking works that harm the rooting system when the main growing period is over in the late autumn / winter period.
- With all stresses it is important to consider how the stresses occur, are they short or long duration, harsh or mild, a single event or multiple exposures and so on? All will impact on the correct measures to tackle the stress and alleviate its symptoms.
- Always try to predict stress, when it will occur, what it will be and how to recover and prepare for it. **GCM**

Figure One: Stress Management: getting the plant through the stress phase.



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