PHOTOS: BEN EVANS, BRETT ROBINSON

Making sense of dollar spot

In this instalment of Tech Talk, Ben Evans takes a closer look at the causes of dollar spot and techniques superintendents can employ to manage this debilitating disease affecting a wide range of turf species.

Dollar spot (*Sclerotinia homeocarpa*) disease is a troublesome recurring problem for golf course superintendents. Although originating as a spot disease, it can quickly form large patches in favourable environmental conditions, and according to Vargas (2005) more money is spent on fungicides to control dollar spot than any other disease of turf.

Dollar spot is identified as small, circular patches which cause small depressions in the turf. These depressions are rarely larger than 5cm, however, they may coalesce into larger patches. These lesions are a tan colour, where the individual leaf blades bear distinct blighted bands, tan to reddish brown, of an hourglass shape.

A silver, grey mycelium (see photo opposite) is present on the surface of the grass when the disease is active. Dollar spot produces a fluffy, white mycelium under controlled conditions, which is felt-like to the touch and turns a shade of grey.

The disease attacks a wide range of turfgrasses including creeping bentgrass (*Agrostis spp.*), winter grass (*Poa annua*), couch (*Cynodon spp.*), seashore paspalum (*Paspalum vaginatum*) and zoysia (*Zoysia spp.*), while in Australia it has also been observed on kikuyu (*Pennisetum clandestinum*). Bentgrass varieties Penncross, SR1020 and Crenshaw are among the most susceptible to dollar spot, while the variety L-93 exhibits strong resistance to the fungus. The 2008 NTEP bentgrass trials in America found Declaration as one of two varieties, to be highly resistant to the disease.

Above: Dollar spot attacks a wide range of turfgrasses including creeping bentgrass, *Poa annua*, couchgrass, seashore paspalum and zoysia, while in Australia it has also been observed on kikuyu

CAUSES

The dollar spot fungus survives as a mycelium in infested plants and plant debris, such as thatch. When temperatures reach 15°C or more, dormancy breaks and the mycelium within the previously infected tissue colonises the foliage. The build-up of disease may be rapid, and the disease has tremendous persistence once established.

As the mycelium extends outwards into the air, it comes into contact with neighbouring leaves and 'bridges' between them. When the mycelium contacts a neighbouring leaf, it may;

- Enter through the stomata;
- Enter through leaf cuts or mown portions; or
- Cause direct penetration

The sexual parts of the fungus, that is the conidia and ascospores, are of minor importance in the spread of the fungus. Movement is largely brought about by the relocation of diseased and infected materials via human foot traffic and turf maintenance equipment.

The disease is active from spring through to late autumn and is favoured by temperatures from 16°C-32°C, with optimal temperatures between 21°C-27°C. High humidity in the leaf canopy is also required for growth of the fungus and in particular stimulates the spores to germinate.

Dew plays a key role in the infection process and dollar spot increases dramatically when dew presence increases. It is this thin film of moisture on the leaf which facilitates many common turf diseases because fungi need a film of moisture in order to germinate, and also to liberate spores from sporophores. In the case of dollar spot, this process only occurs in the presence of water.

By limiting the amount of time a leaf blade is wet reduces disease severity significantly, as it hampers the fungi's ability to germinate. Leaf wetness is perhaps the environmental variable that permits an infection event, but temperature determines the rapidity and extent of that event. Increased periods of leaf wetness also facilitates the bridging process and the spread of disease.

MANAGEMENT

Turfs with low nitrogen contents are particularly susceptible to dollar spot invasion. Beard (1973) and Liu (1995) suggest high nitrogen contents stimulate leaf growth causing the host to outgrow and avoid disease development. There is little evidence to suggest phosphorous or potassium levels influence dollar spot and alterations to pH have shown no effect.

In order to control the disease, opinion is divided as to the reliance on cultural control with minimal fungicide use or the insistence on chemicals as a vital tool in controlling the fungus. Research has demonstrated changes in microclimatic conditions conducive to dollar spot disease can markedly reduce dollar spot infestation. Dernoeden (2002) argues the need to ensure the climatic conditions for growing turf are as sound and healthy as possible and a turf manager should resort to chemical control as sparingly as possible.

Ensuring proper air circulation and sunlight is a key consideration in dollar spot prevention. Koh (2003) found more dollar spot disease occurred in shaded and air flow restricted plots than on plots exposed to full sun. By allowing sunlight, particularly morning sunlight over a turf, allows for dew to evaporate readily. Proper air flow over a turf canopy produces a mixing action, which not only lowers the temperature above the turf but reduces the humidity as well.

Dew management is a key consideration in controlling dollar spot germination and movement. Guttation water is rich in amino-acids and carbohydrates which increase the infection process. Leading turf researchers argue that the turf should never be irrigated late in the afternoon, since this will prolong leaf wetness, particularly in humid weather.

Dew should be removed by any or all means, whether by mowing, rolling, squeegeeing or poling. Ellram (2007) conducted an experiment where dew was removed at different times of the day and found that early morning dew removal reduced dollar spot significantly. Removing dew after 10am had little to no effect because the sun had evaporated most dew already. Daily removal of dew resulted in the lowest infection of dollar spot, irrespective of the method of dew removal. The authors believed this was due to the mechanical disruption of hyphal growth on or between the leaf surfaces.

Ellram also found that dull mowers did not appear to increase the incidence of dollar spot compared to sharp mowers. However, mowing turf achieved significantly better dew removal than a squeegee. Sanitation practices such as washing mowers and equipment before entering a non-infected area should also be adhered to.

When disease pressure is high, application of chemicals such as chlorothalonil, propiconazole or triadimefon is recommended. However, resistance is a significant issue in controlling dollar spot, with resistance to benzimidazoles, anilazine and iprodione chemicals widely reported (Couch 1994). Chlorothalonil is a contact fungicide and when applied at 14-day intervals is considered to be highly effective in combating dollar spot particularly when applied to dry foliage. Chlorothalonil has exhibited low susceptibility to developing resistance to disease.

A silver, grey mycelium is present on the surface of the turf when the dollar spot disease is active

Recent research suggests that the use of composts may reduce the over-reliance on chemicals. The use of organic amendments attempts to produce a long-term change in the soil environment whereby the activities of the indigenous disease-suppressive microbes are favoured (Boulter, 2002). The research indicated that the reduction in disease activity was enough to suggest a viable alternative when disease pressure was low. However, this treatment was not successful when the disease pressure was high.

Fry (2004) argues that the reduction in dollar spot damage was not due to the proliferation of beneficial microbes which antagonise dollar spot, but the increased nitrogen delivered in the composts and fertilisers in the compost products. Fry also discusses an experiment of nine nitrogen sources in controlling dollar spot. Urea suppressed the infestation, while all seven organic sources saw marked increases and outbreaks of disease. Davis (2002) reported similar results where it was found that none of the natural organic fertilisers consistently reduced dollar spot infestation, compared to synthetic organic nitrogen sources.

Smiley (2005) reports on the possibility of biological inoculants. Although, research is not yet to the point of commercialisation, the fungi *Trichoderma harzianum, Bacillus lichenoformens* and *Pseudomonas aureofaciens* show promise. Vargas (2005) reports that when *Pseudomonas aureofaciens* was applied five times a week directly onto a green it was successful in reducing dollar spot damage. However, when nine biostimulants were trialled against urea in reducing dollar spot, all nine of the biostimulant treatments increased dollar spot symptoms compared to fortnightly applications of soluble nitrogen (Fry 2004).

Editor's Note: At the 26th Australian Turfgrass Conference, Michigan State University green speed authority Dr Thom Nikolai outlined some of his research which found that lightweight rolling of greens three days a week instead of mowing on those days reduced the incidence of dollar spot. Full references for this article can be obtained from the AGCSA email info@agcsa.com.au

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