PLANT AND SOIL NEMATODES

MANAGEMENT OF PLANT-PARASITIC NEMATODES ON TURFGRASS

Plant-parasitic nematodes are one of the many stress factors that affect the health of turf. Procedures for determining whether they are likely to be contributing to poor growth problems at a given location are outlined in Fact sheet PSN 020. This fact sheet provides guidelines on the management practices that can be used to reduce their impact.

MINIMISE STRESS FACTORS THAT EXACERBATE THE DAMAGE CAUSED BY NEMATODES

Poor growth symptoms are often seen on turfgrass, and as plant-parasitic nematodes will almost always be present in turfgrass soils, they are often considered the primary cause of the problem. However, situations where nematode damage is severe enough to produce aboveground symptoms usually only occur when a highly pathogenic nematode is present (e.g. southern sting nematode, *Ibipora lolii*). In most cases, nematodes are damaging root systems to some extent but a range of stress factors are exacerbating the problem. Consequently, before deciding that a particular problem is caused by nematodes, it is important to consider whether the turf is responding to stresses such as inadequate moisture, poor nutrition, low mowing heights, or high summer temperatures. If a stress factor is likely to be involved, then establish a management program to minimise its contribution to the problem. Practices that could be used to reduce levels of stress are outlined below.

Increase mowing height

When turf is mown to very low levels, the plant's capacity to produce roots is impaired. Consequently, the turf will have a shallow root system that is limited in its capacity to take up water and nutrients. Raising the mowing height can reduce nematode damage considerably and is an option in many situations. However, golf course superintendents are usually reluctant to raise mowing heights because golfers prefer fast greens. In such circumstances, the best option may be to increase the mowing height for most of the year and reduce it when important competitions are being held, or at times of the year when the turf is best able to cope with leaf loss.

Optimise nutrient inputs

Plants use their roots to take up nutrients that are then transported to their leaves to support photosynthesis and plant growth. However, when roots are stunted or dysfunctional due to nematode damage, nutrient uptake is reduced and nutritional deficiencies may occur. The only way to help the plant cope with its reduced capacity to extract nutrients from the soil is to apply nutrients regularly and ensure that nutrient inputs are adequate.

Improve irrigation practices

When turf has a deep root system, it can tolerate the effects of nematodes to some extent. Thus, deep but infrequent watering should be used wherever possible to encourage deeper root growth. However, when nematode damage is severe, frequent light watering is required because the shallow root system requires regular water inputs.

Minimise compaction and improve aeration

Compaction is detrimental to root growth because it limits water infiltration, reduces the capacity of roots to elongate, and destroys the pore spaces which allow oxygen to permeate through the soil. Thus, when root systems are suffering nematode damage, compaction will exacerbate the problem. Turf that is compacted due to heavy traffic must therefore be aerated so that roots can elongate and absorb water and nutrients.

Reduce shading problems

When turf is shaded by trees, the grass cannot photosynthesise to the same extent as it would in full sun, and so root growth is diminished. If the turf is nematode-infested, trimming, thinning, or removing the trees to reduce shading will enhance the turf's capacity to withstand nematode damage.

DETERMINE WHETHER NEMATODE CONTROL MEASURES ARE WARRANTED

Once action has been taken to minimise stress factors that may be affecting the growth of turfgrass, the next step is to determine whether nematode control measures are warranted. This is best done by establishing a monitoring program in which samples from areas that are typical of the turf being managed are forwarded to nematology laboratory every few months. The results obtained will indicate which nematodes are present, whether populations of certain nematodes change with the season of the year, and whether numbers are affected by management practices.

Once the nematodes present at a particular location are known, it is necessary to determine whether they are causing problems. One way of doing this is to collect samples from areas where the turf is in poor condition, and from adjacent areas where the turf is healthy. If populations of potentially damaging nematodes are much higher in areas where the turf is performing poorly, then a control program would be considered. However, if one of the stress factors discussed above may be contributing to the problem, then that issue should be tackled first, regardless of the nematode counts obtained.

ESTABLISH AN INTEGRATED NEMATODE MANAGEMENT PROGRAM

In the 20th century, nematode management in turfgrass was dominated by fumigants and non-volatile nematicides. Volatile chemicals such as methyl bromide, ethylene dibromide and 1,3 dichloropropene were sometimes used to fumigate areas where turf was being planted, and organophosphate and carbamate nematicides were applied to established turf. However, most of these chemicals are no longer available due to human safety and environmental concerns, while the use of others is severely restricted. Consequently, multiple practices are now required to reduce nematode populations to non-damaging levels, a concept that is known as Integrated Nematode Management.

Most of the crops grown in Australia suffer damage from plant-parasitic nematodes, and because research on control measures has been undertaken for many years, growers have access to a range of practices which can be used to reduce yield losses. Unfortunately, the research required to develop integrated management programs for turfgrass nematodes has not been done, and so chemical nematicides are the only control option available to turfgrass managers.

NEMATICIDES REGISTERED FOR USE ON TURFGRASS

As of January 2023, only two nematicides were registered for use on turfgrass in Australia: abamectin (Agador®, Thumper®) and fluopyram (Indemnify®). These products are less toxic to humans than the old nematicides, but instructions on the product label should be followed to minimise health risks to applicators.

Abamectin was found to be nematicidal in the 1980s but has never been widely used against nematodes because it binds readily to organic matter and does not move well in soil. Thus, if it is used in turfgrass, it is important to check that has moved through the thatch layer and reduced nematode populations to depths of 20 cm. Fluopyram is a much newer chemical and so little is known about its efficacy. However, it will move through the thatch layer and its half-life in soil is greater than 6 months, which is much longer than most other nematicides

As the efficacy of the above products has not been confirmed by scientists who are independent of the manufacturers, anyone using these nematicides should check whether they are effective. Also, these nematicides should not be used regularly because soil organisms (usually bacteria) may utilise the chemical as a food source and rapidly reduce its concentration to levels that are no longer effective, a phenomenon that is known as enhanced microbial degradation.

FUTURE OPTIONS

The Australian turf industry needs to reduce its reliance on chemical nematicides, and the only way to do this is to undertake research on alternative control methods. There are several areas where research is warranted and they are discussed in Fact sheet PSN 022. Turfgrass managers who wish to move away from nematicides could perhaps set up trials to evaluate some of these non-chemical practices.

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