

Nematodes

Introduction

Nematodes remain a major challenge for greenkeepers. In the last 10–15 years, research and field observations have provided a variety of options for either controlling, or in most instances suppressing nematodes and their effects on bowling greens.

There are two main species of nematodes that create problems on bowling greens:

Dagger nematode (*Xiphinema sp*) is visible and is generally a white/translucent hair like strand, which attacks *Cotula's dioica/maniototo* and starweed.

Root Knot nematodes (*Meloidogne sp*) are microscopic and whose main diagnostic feature is the presence of galls (“knots”) on a generally stunted root system. Root Knot nematodes are now less common and are primarily observed attacking *Cotula dioica*, particularly within the North Island.

Damage symptoms

Nematodes rarely kill the plant. Instead, as a result of their feeding activity, the root system is severely damaged, limiting the uptake of water and nutrients. Consequently, the loss of cover that typically occurs is as a result of:

- Heat stress (particularly with *dioica*),
- Drought,
- Poor vigour preventing recovery by the plant (particularly with starweed and winter leaf *maniototo*) following play.

Damage from nematodes typically occurs in the same areas on the greens each year and is observed from spring until early winter. The affected areas will range in size from approximately 300mm to several metres in size. Initially the plants will turn a yellow – orange/brown colour, before the turf cover starts to thin. The root system will be extremely stunted (generally < 10mm long) and typically a brownish colour.

Control strategies

Monitoring

Once damage is observed, which typically occurs from November onwards, it is often too late to change your management practices, with the plant having already suffered serious damage to the root system.

For those clubs that have a history of nematodes, it is desirable to commence a sampling programme from August onwards. This involves taking 50mm soil samples from the edge of historically occurring nematode-affected areas and considering the health and depth of the root system.

Management practices

Root zone improvement

Management practices should encourage a deeper root system by targeting:

- Improving soil structure using renovation treatments such as the Verti-drain, Hydro-Ject, etc during April-June and August-November, when most new root development occurs,
- Reducing thatch,
- Identify and address the cause(s) of poor drainage.

Fertility

Once nematode damage occurs, the objectives of the fertiliser programme are:

- During autumn and/or spring when conditions are favourable for root development, using an N-P type fertiliser that contains a soluble phosphorous source such as Diammonium phosphate or Mono ammonium phosphate, to stimulate recovery of the root system.
- During the playing season applying as required to the affected area, a (foliar) fertiliser at light rates (approximately every 2-3 weeks) to maintain plant vigour and hence recovery from play.

Irrigation/heat stress management

Once damage occurs, irrigation practices need to change in order to achieve the following goals;

- To maintain moisture slightly below your effective rooting depth. The shallower root system that occurs as a result of nematode activity will typically require less water being applied at any given watering and that irrigation is carried out more frequently.

Care is required to avoid heavy watering which will result in saturated soil conditions below the root system and hence limit its future recovery.

- To manage heat stress will require syringing of the nematode affected areas.

Chemical control

The main nematicides used on NZ bowling greens are:

- Vydate (oxamyl)
- Nemaicur (fenamiphos)

Regrettably the chemical control of nematodes is unreliable and often provides little more than suppression of the nematode problem for 1 or 2 seasons. For best results when applying nematicides:

- i. Open up the surface to the depth (approximately 50-60mm) where nematodes are active. Anecdotal evidence indicates that injecting the nematicide with the Hydro-Ject can provide an improved level of control.
- ii. Schedule spraying when soil temperatures are warm (>14 – 15°C).
- iii. Schedule spraying in late spring – early summer, before serious damage occurs and/or during autumn to encourage recovery.
- iv. Wash the products in with 10 -12mm of water. This should be applied as several short cycles that prevent ponding of water.
- v. In severe nematode outbreaks, several nematicide applications maybe required at 3-4 week intervals. This will assist to improve the level of control by extending the period that the nematodes cannot feed.
- vi. **Finally these products are extremely toxic and appropriate protection for the greenkeeper, bowlers and environment should be observed.**

Organic options

There are a variety of “natural options” available for use in either suppressing nematodes and/or encouraging a stronger plant. The results from these programmes are variable and will depend on both the severity of the nematode problem and quality of the management plan. The main options presently used on bowling greens and their action are summarised in Table one.

The programme adopted is product dependant and will typically require:

- frequent applications (approximately monthly) during spring – autumn,
- commencement prior to either damage occurring and or the nematodes becoming active ie. North Island; August-September and South Island; September-October onwards.

Major effect	Deter feeding activity by nematodes	Encourage root development	Act directly on the nematode	Bio diversity
Organic options	Garlic "tea"	Some seaweed products	Sugar/molasses	Naturally occurring fungi, bacteria, predatory nematodes or other "organisms" that attack and/or kill parasitic nematodes
	Marigold "tea"			
	Rhubarb "tea"			
	Neem			
	Some seaweed products			
Plant "teas" are made by soaking the likes of Garlic, Marigold or Rhubarb in water for 2-3 weeks and then applying the resulting "tea" to the green, followed by washing it into the profile.				

Additional information

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