



Root-knot nematode

Meloidogyne minor

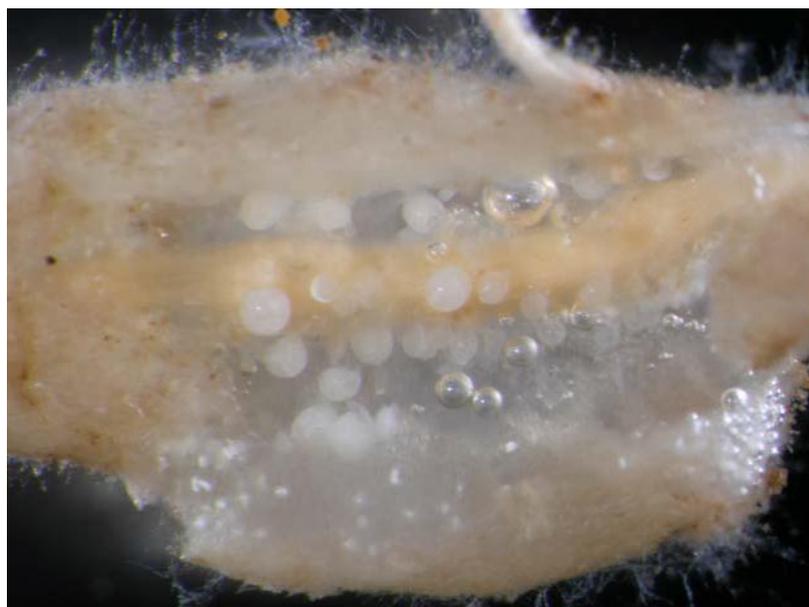


Figure 1. *Meloidogyne minor* infesting potato roots, courtesy of Colin Fleming, AFBINI

Background

Meloidogyne minor (Karssen *et al.*, 2004), like other *Meloidogyne* spp., is commonly known as a root-knot nematode. This species was formally described following findings on potato roots in the Netherlands and on turf on golf courses in the UK and Republic of Ireland. Since its description, *M. minor* has been recorded causing severe quality damage to some potato varieties, with symptoms on tubers and roots similar to those caused by other quarantine listed root-knot nematodes. On amenity turf, it typically causes the symptoms associated with yellow patch disease and loss of turf density.

Geographical Distribution

Meloidogyne minor is native to the UK. It has been reported from The Netherlands, Belgium, Republic of Ireland, Portugal, Chile and the United States. Due to its relatively recent description, the geographical distribution of this species has not yet been fully recorded.

Host Plants

Grasslands and dune areas are the presumed natural habitat of *M. minor*. This

species has been reported infesting a wide range of grasses, broadleaved weeds and crops including *Agrostis stolonifera* var. *stolonifera* (creeping bentgrass), *Lolium perenne* (perennial ryegrass), *Solanum tuberosum* (potato), *Anagallis arvensis* (scarlet pimpernel), *Festuca* sp. (fescue), *Medicago lupulina* (black medick), *Poa* sp. (bluegrass), *Phleum pratense* (timothy), *Trifolium pratense* (red clover), *Trifolium repens* (white clover) and *Trifolium* sp. (clover).

This nematode has also been shown to reproduce on the following hosts under experimental conditions: *Avena sativa* (oat), *Dacus carota* (carrot), *Hordeum vulgare* (barley), *Lactuca sativa* (lettuce), *Lolium multiflorum* (Italian ryegrass), *Lolium perenne* (perennial ryegrass), *Lolium* sp. (ryegrass), *Medicago sativa* (alfalfa), *Phacelia tanacetifolia* (phacelia), *Solanum esculentum* (tomato), *Triticum sativum* (wheat) and *Vicia sativa* (vetch).

Description

Meloidogyne minor is a microscopic invertebrate, consequently adult female nematodes will be difficult to discern without the use of a magnifying lens. **Eggs** are very small, approximately 90 µm long and 50 µm wide and are contained as a mass within a gelatinous matrix, about five to six times the size of the adult female. This matrix is usually attached to the posterior of the nematode. **Infective juveniles** and **males** are soil borne, vermiform in shape and around 380 µm and 1 mm in length respectively. **Adult** females are usually embedded within plant roots or tubers (Fig. 1). Females are pearly white, globose in shape with a distinctly offset neck region, approximately 90 µm long and 50 µm in width.

Biology

The lifecycle of *M. minor* is similar to that of other root-knot nematode species. All root-knot nematodes pass through an embryonic stage, four juvenile stages and an adult stage. Root-knot nematode eggs are enclosed in a gelatinous matrix, which is attached to the posterior of the female. The matrix initially forms a canal through the outer layers of root tissue and later surrounds the eggs, providing a barrier to water loss by maintaining a high moisture level around the eggs. Hatching of *Meloidogyne* eggs is temperature driven and occurs without requiring stimulus from plant roots; however, root diffusates sometimes stimulate hatching.

The infective juveniles accumulate at the region of cell elongation just behind the root cap, even of plants resistant to root-knot nematodes. They are also attracted to apical meristems, points where lateral roots emerge, and invasion sites of other juveniles. The juveniles migrate within the root and eventually promote parenchyma cells to become multinucleate and form feeding cells, generally known as giant cells.

As giant cells form, the surrounding root tissue gives rise to a gall in which the developing juvenile is embedded. The root tip may enlarge and root growth often stops for a short period. After further feeding, the juveniles moult three times and eventually become adults. The life span of an adult female may extend to three months, and many hundreds of eggs can be produced. Females can continue egg laying after the harvest of aerial parts of the plant and the survival stage between crops is generally within the egg. Field

observations on populations of *M. minor* infesting potato have indicated that only one generation per season is likely to develop.

Damage and Detection

Typical symptoms of infestation by root-knot nematodes are gall formation on roots and tubers. However, above-ground symptoms observed on infected plants are similar to those produced on any plants having a damaged and malfunctioning root system. Symptoms include: (i) suppressed shoot growth and accompanying decreased shoot–root ratio; (ii) nutritional deficiencies showing in the foliage, particularly chlorosis; (iii) temporary wilting during periods of mild water stress or during midday, even when adequate soil moisture is available; and (iv) suppressed plant yields. The importance of these symptoms is often related to the number of juveniles penetrating and becoming established within the root tissue of young plants. The common explanation for these above-ground symptoms is that *Meloidogyne* infection affects water and nutrient uptake and upward translocation by the root system.



Figure 2. Potato crop exhibiting infestation symptoms by *M. minor*, courtesy of Colin Fleming, AFBINI



Figure 3. *M. minor* infesting potato roots, causing typical root galling, courtesy of Colin Fleming, AFBINI

Economic Impact

In general, the economic importance of most root-knot nematodes is related to yield reduction, growth reduction and deformation or similar kinds of damage to host crops, which reduces the marketability of produce. Yellow patch disease on creeping bentgrass usually develops from April, a couple of days after torrential rain, and persists until November each year. High-density populations have been shown to cause loss of turf density and increased wear and tear. This results in a quite dramatic visual effect (due to the extent of patch development across affected greens) and significant damage to the turf from normal play.



Figure 4. Damage to potato tubers caused by root-knot nematode infestation (symptoms exhibited will depend on variety), courtesy of Defra



Figure 5. Yellow patch of golf turf, courtesy of Colin Fleming, AFBINI

Advisory Information

Currently for *M. minor*, potatoes and other host crops grown after pasture land on sandy soils would be most at risk. Sampling for plant-parasitic nematodes pre-planting will provide information on the identity of field populations. Control strategies based on the growing of non-hosts or resistant (trap) crops (or cultivars) in a crop rotation system may be effective. However, at present only a few crops are known on which *M. minor* is not able to multiply, notably Tagetes and maize. The application of nematicides reduces the impact of *M. minor*, but if the host is not rotated with other plants, the impact of treatments will be shortlived. Thus, the application of nematicides may only be a supportive measure in combination with appropriate crop rotation. Farmers and green keepers should ensure that soil and plant material are not moved from infested fields and locations, especially when using machinery.

Short-term masking of symptoms can be achieved by foliar applicants of nutrients. This is not a control option, but can reduce symptom expression. The foliar application bypasses the damaged roots in order to sustain sufficient growth to prevent loss of turf cover during the summer months. Damage could be prevented by using soils with a lower percentage of sand. However, this would result in other unwanted side-effects.

In the UK, a nematicide based on garlic extract (Eagle Green Care) is registered for application to amenity and sports turf.

Statutory action will not be taken against findings of *Meloidogyne minor* and it is not necessary to notify the authorities if the pest is found.

For additional information on UK Plant Health please see:

<https://secure.fera.defra.gov.uk/phiw/riskRegister/>

<https://www.gov.uk/plant-health-controls>

<https://www.dardni.gov.uk/>

<https://www.gov.scot>

Authors

T. Prior (Fera), H. Anderson & D. Eyre (Defra). May 2015

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