Guava root-knot nematode

Guava root-knot nematode (*Meloidogyne enterolobii*) is a highly pathogenic and invasive nematode species. Despite its common name, it has a broad host range including many vegetable crops, ornamental plants and weeds. It has been identified as a high priority pest in the biosecurity plans for the ginger, papaya, potato, sweetpotato and vegetable industries.

Image 1 Severe root galling on tomato by guava root-knot nematode

Scientific name

Meloidogyne enterolobii

Cause

Like other root-knot nematode species, guava root-knot nematode induces galls on the roots of infected plants. In severe cases, extremely large and numerous galls can be found. Above-ground symptoms include stunted growth, wilting and leaf yellowing. Crop yield can be greatly reduced, and the quality of root and tuber commodities severely affected. In addition, guava root-knot nematode infection may favour further attacks on roots by secondary plant pathogens, such as root-rotting fungi.

Guava root-knot nematode is very damaging due to its ability to develop and reproduce on crops that are resistant to other species of *Meloidogyne*. It also had a higher infection rate and induces more severe root galling than other species of root-knot nematode.

Other names

Root-knot nematode

Description

The appearance of guava root-knot nematode is very similar to other species of root-knot nematode. All life stages of *M. enterolobii* are microscopic and require magnification to be seen.

Juveniles

Second stage juveniles are translucent and vermiform (worm-shaped), with a tapered tail and rounded head with a delicate stylet.

Adults

Females are white, pear-shaped with projecting necks tapering to the head, and can be variable in size.

Males are translucent, vermiform (worm-shaped), with a rounded head and blunt, rounded tail. They are much larger than juveniles with a more robust stylet and head framework.

Symptoms

Symptoms caused by guava root-knot nematode are similar to those caused by other species of root-knot nematode, although on certain crops, symptoms of guava root-knot nematode infection are more severe than other species of root-knot nematode.

Typical symptoms include severe galling (knotty root growths stimulated by nematode infection) of the root system, and above ground symptoms such as stunted growth, wilting, and leaf yellowing, which may resemble water and nutrient stress.

Guava root-knot nematode also directly infects edible below ground parts of the plant, like bulbs (e.g. nutgrass), rhizomes (e.g. ginger), swollen roots (e.g. sweetpotatoes), and tubers (e.g. potatoes). These can be severely deformed with large galls, a dark and cracked surface, and white round females can be found under the surface when cut open and examined with a microscope or hand lens.

Image 2 Cucumber root system damaged by guava root-knot nematode

Distribution

Internationally, guava root-knot nematode is found in tropical to subtropical areas of the world, including Central and South America, Africa, and Asia. More recently, it has been identified in several countries in Europe and the Mediterranean.

It has been detected in Australia—in Queensland and the Northern Territory.

Hosts

Guava root-knot nematode is highly polyphagous with a broad host range including but not limited to:

- coffee
- cotton
- ginger
- guava
- ornamental plants
- papaya
- soybean and common bean
- sweetpotato
- vegetables
- watermelon
- tobacco
- weeds.

Life cycle

The life cycle of guava root-knot nematode is very similar to other root-knot nematodes.

The eggs hatch as second-stage juveniles into soil. These juveniles then migrate in water films through the soil searching for susceptible host roots. Juveniles are the only infectious life stage. Once a suitable root is found they invade the root tip and establish a permanent feeding site, where the third and fourth stage juveniles and developing adults feed.

The plant responds to the nematode invasion with root cells surrounding the feeding site enlarging and multiplying, to form a gall in which the juveniles and developing adults are embedded.

The juveniles eventually develop into globose females or vermiform (worm-shaped) males. Females produce eggs which are deposited into a gelatinous matrix known as an egg mass outside the gall.

A single female can produce 500-1000 eggs. Mature males cease feeding and exit the roots. Males are not required for reproduction (mitotic reproduction).

How is it spread

As with all root-knot nematode species, guava root-knot nematode can be easily transmitted with soil and plant material. Infested soil and growing media, plants for transplanting, bulbs, and edible tubers from sites where guava root-knot nematode occurs are the most probably pathways of introduction into new areas. Soil attached to machinery, tools, footwear or plant products are other possible pathways.

Monitoring and action

Inspect crops regularly for plants with poor vigour, stunting or reduced yield and if detected, inspect underground plant parts for the presence of galls.

If you suspect guava root-knot nematode, report it immediately to the Exotic Plant Pest Hotline on 1800 084 881 or to Biosecurity Queensland on 13 25 23.

Testing soil and plant material

If galls are found on the roots of inspected plants, a sample of roots and accompanying soil should be collected.

- Cut the stem of the plant just above the soil line (dispose of the above-ground parts of the plant).
- Sample the entire root system (for small plants) or 3 to 5 larger roots containing galls (for large plants).
- Include a handful of accompanying soil with the roots in the ziplock sample bag—roots and soil from the same patch/site can be placed in the same bag.
- Collect 300g of root material and 500g of soil from 3 to 5 plants in each patch/site in the block:
    - small plants—place the roots and soil in the same bag.
    - large plants—place 3 to 5 roots per plant in 1 bag and soil in another bag.
- Store the sample at 12 to 16ºC—you can store short-term in air-conditioned offices (usual temperature of 24ºC).
- Do not refrigerate the soil—ice packs are not necessary.
- Do not allow the soil to get hot (>40ºC) once sampled.
- Storage containers should:
    - be labelled ‘GRKN soil samples’
    - weigh no more than 10kg
    - contain samples packed to minimise movement during transit.

To submit samples to Biosecurity Queensland’s Plant Biosecurity Laboratory:

- complete a sample submission form (https://www.publications.qld.gov.au/dataset/plant-biosecurity-laboratory/resource/df823a3d-894e-4192-800a-c19cdde72a5d)
- properly prepare and send your samples for analysis (https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/crops/test/plant-biosecurity-laboratory).

Prevention

There are simple steps you can take to protect your farm or property.

- Source planting material from reputable suppliers and request a written statement indicating the absence of plant-parasitic nematodes.
- Ensure planting material is free from soil and plant residues.
- Purchase healthy seedlings from reputable nurseries.
- Keep records of where plants/planting material/tubers are sourced from, and where and when they are planted on your property.
- Check planting material on arrival to make sure they look healthy and visibly free of all pest and disease symptoms.

- Regularly check your farm and report any unusual or unfamiliar symptoms or damage to plants.

Protect your farm from emergency plant pests:

- Protect your farm from emergency plant pests (https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/diseases/manage/protect)
- Biosecurity manual for the nursery production industry (PDF, 3.1MB) (https://planthealthaustralia.com.au/wp-content/uploads/2012/12/Biosecurity-Manual-for-the-Nursery-Production-Industry.pdf)
- Biosecurity manual for Bundaberg horticultural farms (https://planthealthaustralia.com.au/wp-content/uploads/2012/12/Biosecurity-Induction-Manual-for-Bundaberg-Horticultural-Farms.pdf
- Understand good farm biosecurity (https://www.daf.qld.gov.au/business-priorities/biosecurity/animal-biosecurity-welfare/animal-health-pests-diseases/protect-your-animals/property-biosecurity)
- Visit the farm biosecurity website (https://www.farmbiosecurity.com.au/).

Legal requirements

Everyone in Queensland has a general biosecurity obligation (GBO) (https://www.daf.qld.gov.au/business-priorities/biosecurity/policy-legislation-regulation/biosecurity-act-2014/general-biosecurity-obligation) under Queensland's *Biosecurity Act 2014* to manage biosecurity risks. If you think you have found guava root-knot nematode you must report it and take all reasonable and practical steps under your control to minimise any associated risks.

Report suspected guava root-knot nematode to Biosecurity Queensland immediately on 13 25 23 or contact the Exotic Plant Pest Hotline on 1800 084 881.

Further information

Find out more about root-knot nematode (https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/insects/horticultural/root-knot-nematode).