FACT SHEET
Guava root-knot nematode

Guava root-knot nematode (GRKN, *Meloidogyne enterolobii*) was detected in Australia in late 2022. This microscopic pest, primarily found in tropical regions, has rapidly spread around the world and is among the most damaging species of root-knot nematodes (RKN). In Australia, it has been identified in residential gardens and commercial farms in the Northern Territory and a few restricted sites in Queensland. Its potential spread in Australia is uncertain, and its wide host range and lack of resistant cultivars mean that damage can be severe, making it more difficult to control.

Hosts

GRKN and other RKN species can infect most vegetable crops.
Preferred hosts include:



Solanaceous vegetables like tomato, potato, eggplant, capsicum and chilli



Cucurbits like pumpkin, melons, cucumber and zucchini



Other vegetables such as carrots, beans and lettuce

Few crops have been reported to be non-hosts or poor hosts for GRKN. Scan or click on the QR to see the full known host list.

Symptoms - what do infected plants look like?

GRKN infests the plant's root system (b), disrupting uptake of water and nutrients and so affects growth, yield, and tolerance to stress of affected plants. Plants may show yellowing, stunting and wilting (a). Roots of infested plants have typical root-knot nematode galling (appear lumpy) (c)(d), which can be severe. Tuber crops may also be damaged or blemished (e), impacting on their saleability.



Image credits: Tony Pattison (a, b, c), Sebastian Kiewnick (d) and Wayne O'Neill (e)

Spread - how can GRKN move around?

Nematodes spread slowly on their own, so humans play a big role in their movement. They can be transmitted through infected plant material like bulbs and tubers, contaminated soil, and even farm equipment, tools, and shoes that have touched and may be carrying infested soil.



On-farm biosecurity is the best way to keep GRKN & other RKNs out of your property!

Simple, low-cost measures can make a big difference in keeping your farm safe!

Come clean, go clean
Anything moved onto your property may carry root-knot nematodes. Clean footwear, tools, vehicles before moving between sites.

Monitor who & what comes on to your property
Biosecurity signage & restricting access (particularly in production areas) will help to manage movement.

Hort Innovation VEGETABLE FUND

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FACT SHEET
Guava root-knot nematode

What we know about managing GRKN so far

Soil sampling & crop monitoring

Regular soil sampling & testing for nematodes, as well as monitoring crops for symptoms of damage, especially root galling, helps to detect nematodes early.
Knowing which nematode pests you are dealing with is key to management.

Crop rotation

Like other root-knot species, rotation with non-host crops, or clean (volunteer and weed-free) bare fallows are the best way to reduce GRKN populations to low levels between vegetable crops.

Research on the most resistant rotation crops is continuing. Some options that have shown good resistance in experiments to date include:

- some varieties of forage sorghum,
- sunn hemp,
- peanut,
- some varieties of oats and
- some pasture grasses (e.g. Rhodes and signal grass)

What should you do if you suspect GRKN?

! There are currently no restrictions on the interstate movement/trade of plants or plant products in Australia related to GRKN

Growers are encouraged to submit samples of plant material they suspect to be infected with GRKN to a diagnostic laboratory. This will help researchers to better understand the distribution, biology and emerging impacts of this nematode in Australia.
For further information or to find out how to submit a sample, please contact:

Wayne O'Neill
Plant Pathologist, Queensland Department of Primary Industries
T: 07 3708 8451
E: wayne.oneill@daf.qld.gov.au

Help us transform the management of GRKN in vegetables!

By telling us about your needs and the impact of nematodes on your business, you'll help the innovative new project led by the Queensland Department of Primary Industries (DPI) project to map the distribution of GRKN & related nematode species in key vegetable production areas.

The project will investigate management options for industry, including:

A rapid and accurate diagnostic assay for the identification of these nematodes from root and soil samples, enabling growers to make informed management decisions

Evaluating the resistance of different cover crops so that growers will have rotation options for management if GRKN is found in their area

Have your say and help us develop the tools you need to crack down on GRKN! Please complete the project survey by scanning or clicking this QR code:

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AGRICULTURE VICTORIA

Do you have Guava Root-Knot Nematode (GRKN) in your crops?

Agriculture Victoria Crop Health Services is offering growers free testing for Guava Root-Knot nematode (GRKN) in vegetable and fruit. We suspect GRKN may be more widespread within Australia than known detected areas within Northern Territory and Queensland and are encouraging growers to send in samples of any plants showing possible signs of GRKN infection.



Image 1: Female root-knot nematode embedded in a root of host plant.

WHAT IS GUAVA ROOT-KNOT NEMATODE?

Guava Root-Knot Nematode (GRKN) (*Meloidogyne enterolobii),* is a tiny round worm that infects and causes disease in a wide range of plants. It can reproduce quickly and cause yield loss in host plant crops.

The nematode was first detected in Northern Territory in 2022 and has since spread to Queensland at a few sites. It can infect a wide range of fruits and vegetables in tropical and subtropical climates notably:

- sweet potato
- cabbage, bok choy and pak choy
- paw paw, guava and cape gooseberry
- tomatoes, eggplant and chilli
- melons, cucumbers, zucchini and pumpkins
- snake bean and soy bean.

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SYMPTOMS

Signs of a possible GRKN infection include:

- galling, which can range from one or two galls or wart-like lumps to extremely lumpy roots in severe infestations. In tuber vegetables, blemishes or cracks are visible.
- wilted, yellowing leaves.



Images 2-4: Root-knot nematode damage on tomato roots, potato tubers and beetroot

HOW TO SUBMIT A SAMPLE

If you suspect GRKN or any other nematode infection in your crop, please submit a root and soil sample to Agriculture Victoria Crop Health Services, for a free diagnosis.

Instructions:

- Place the roots and approximately 500 g of the surrounding soil in a plastic zip lock bag. Double bag the sample for extra protection.
  1. Fill in the sample submission form found here:

     https://go.vic.gov.au/49U9TcD
  2. Send the sample to:

     AgriBio Specimen Reception
     Main Loading Dock
     5 Ring Road
     La Trobe University
     Bundoora VIC 3083

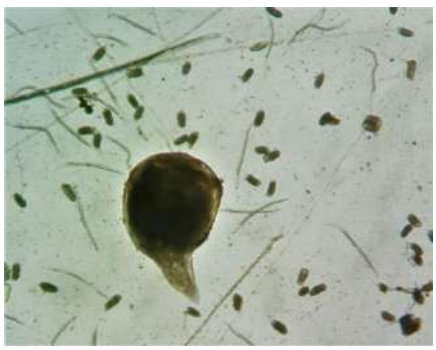


Image 5: A microscopic view of a root-knot nematode female surrounded by eggs and juveniles

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Enquiries:

Dr Chantelle Girgan, Senior Diagnostician and Research Scientist
Email: chantelle.girgan@agriculture.vic.gov.au

The analysis report will include the species of root-knot nematode detected the number of nematodes detected and any other plant-parasitic nematodes, if present. It will also include a basic soil health analysis using free-living nematodes.

There are currently no domestic market access regulations in place for GRKN and Victoria has no intention to impose quarantine measures should GRKN be detected in Victoria.

Photo credits

Image 1: National Collection of Nematodes, Plant Health and Protection, Agricultural Research Council, South Africa. Photo taken by C Girgan
Image 2: National Collection of Nematodes, Plant Health and Protection, Agricultural Research Council, South Africa. Photo taken by C Girgan
Images 3-5: National Collection of Nematodes, Plant Health and Protection, Agricultural Research Council, South Africa. Photo taken by C Girgan and M Marais

Project details

Agriculture Victoria is conducting this research within Crop Health Services as part of a Hort Innovation project (VG23007) using the research and development levies (specifically from the Vegetable Fund) with contributions from the Australian Government. The Department of Agriculture and Fisheries Queensland are leading this project in collaboration with institutions across Australia.

References

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Guava root-knot nematode: Sampling guide

Guava root-knot nematode (GRKN, *Meloidogyne enterolobii*) is a damaging microscopic pest, found mainly in tropical areas.

In Australia, it has been found in residential gardens and commercial farms in the Northern Territory and limited sites in Queensland.

Its potential spread is uncertain, and its wide host range and absence of resistant hosts complicate control and increase potential damage.

What do infected plants look like?

GRKN disrupts plant root systems, affecting water and nutrient uptake, impacting growth and yield. Symptoms include yellowing, stunting, wilting, and lumpy root-knot nematode galling. Tuber crops may also be damaged, reducing saleability.



Image credits: Tony Pattison (a, b, c), Sebastian Kiewnick (d) and Wayne O'Neill (e)

What should you do if you suspect GRKN?

Get in touch or submit a sample!

To help researchers learn about where this nematode is found, how it lives, and its effects, please send samples of any plant material you think might be infected with GRKN to a diagnostic lab.

Speak to Dr Mel Ford

(08) 8999 2218

melanie.ford@nt.gov.au
or
Plant Pathology
plant.pathology@nt.gov.au

Submit a sample!



If you see symptoms of root knot nematodes, you can grab a sample & send it in for ID.

Turn over to see our quick guide on how to sample for GRKN.

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Queensland Government

Guava root-knot nematode Sampling guide

1. Look for plants (crop or weeds) that appear stunted, wilted, yellow, &/or generally less healthy than the rest.



2. For annual crops & weeds: Gently pull up the root system to look for lumps (galls). Cut the top off the plant, shake off excess soil and place the roots in a zip lock plastic bag.
   For perennial crops: Dig around root system, 100-300 mm under the soil surface, & look for lumpy roots. Using secateurs, cut off the roots & place in a zip lock plastic bag.



3. Double bag by placing the plastic bag of roots into another bag.

4. Using a permanent marker, label the bag with date, crop/plant type (if known), & location (e.g., Batchelor, Humpty Doo, etc.)



5. Clean your boots, trowel, secateurs, etc. by removing all soil and spraying/washing with a 1% bleach solution.

6. Fill out a sample form.
   Copies are available at Berrimah Farm sample drop-off point or download a sample submission form here:

7. Call or email to let us know you are sending a sample
   (08) 8999 2218 or plant.pathology@nt.gov.au

8. You can deliver or courier your samples to:

Attn: Mel Ford
Berrimah Farm Science Precinct
CSS Building, 29 Makagon Road
Berrimah, NT 0828

If you are in a regional location, please contact our team to discuss other options, including drop-off at a regional research station.

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Department of **AGRICULTURE AND FISHERIES**

Biosecurity

Guava root-knot nematode management



Introduction

Guava root-knot nematode (GRKN), *Meloidogyne enterolobii*, is a microscopic plant-parasitic round worm, found mainly in tropical areas. It has a broad host range which includes many important horticultural crops, ornamentals and some weed species.

The first Australian detection of GRKN occurred in September 2022, on several properties in the greater Darwin region. It has now been detected in Queensland. While many other *Meloidogyne* species are already present in NT (*M. javanica*, *M. incognita*, and *M. arenaria*), GRKN is considered significant because of its wide host range, high reproduction rate, and impacts on yields in preferred host crops.

Hosts

GRKN has a wide range of hosts. Some NT host crops are listed below.

Banana	Capsicum	Eggplant	Guava	Pak choy	Soybean
Buk choy	Chilli	Fig	Jackfruit	Papaya/pawpaw	Sweet potato
Cabbage	Cotton	Gai lan	Melons	Pumpkin	Tomato
Cape Gooseberry	Cucumber	Galangal	Okra	Snake bean	Zucchini

For more information, go to daf.nt.gov.au

@AgricultureNorthernTerritory
Department of Agriculture and Fisheries T: 08 8999 2258

NORTHERN TERRITORY GOVERNMENT

Guava root-knot nematode management

Symptoms

Typical symptoms of GRKN infection include lumpy growths on roots, called galls. Tuber crops can also be damaged. Above ground, plants may appear yellow, stunted, and wilting. The effects of GRKN can often be mistaken for water or nutrient deficiency, so it's important to check your roots for signs of the pest.

Spread

Nematodes cannot move very far on their own. Humans play a big role in their spread and introduction into new areas. They can be transmitted through infected plant material, such as bulbs, tubers, and roots, and via contaminated soil. GRKN can hitchhike on boots, tools, and farm equipment that has touched infested soil.





GRKN infested roots with lumps, called galls.

Management

Management of GRKN can be costly and complex. Research is underway to determine regionally appropriate management strategies. Below is a list of what we know so far about management in the NT.

On-farm biosecurity is the best was to keep GRKN and other RKNs out of your property!

- ✔ Come clean, go clean

  Anything moved into your property may carry root-knot nematodes. Clean footwear, tools, machinery, and vehicles before moving between sites.
- ✔ Monitoring who and what comes to your property
- ✔ Source clean seedlings and plant material

Soil sampling and crop monitoring

Scouting for symptoms of damage helps to detect nematodes early. Regular soil sampling and testing is key to management. It will help you understand which nematode pests you have and how to manage populations.

Crop rotation or bare fallows

Cultivating a non-host cover crop is the best way to reduce GRKN populations between annual crops. Research on the most resistant crops is ongoing. Some options that have shown good resistance in experiments include:

Forage sorghum (some varieties)	Oats (some varieties)	Rhodes grass
Signal grass	Sunn hemp	Peanut

Weed-free bare fallows reduce populations by removing all food sources for the nematodes and exposing the upper layers of the soil to heating/drying action of the sun. Suppressing all weeds and volunteers is critical for bare fallows to be a useful management strategy.

For more information, go to daf.nt.gov.au

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Department of Agriculture and Fisheries T: 08 8999 2258

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Guava root-knot nematode management

Managing weeds

Suppressing weeds is important as some of these plants are hosts of GRKN and maintain populations in the field.

Organic amendments

Organic amendments, such as mulch, compost and green manures, are a way to increase the activity of soil microbes, which can enhance the populations of predators and parasites of nematodes.

Chemical treatment

Nematicides may be considered in combination with integrated pest management (IPM) practices. Prior to chemical application, it is recommended that nematode counts and/or DNA tests are performed to identify the pest and estimated population. Check the APVMA database for registered chemicals, read labels, and observe withholding periods.

For more information

Contact: (08) 8999 2218 or
email plant.pathology@nt.gov.au for sample specific enquires.

Go to: nt.gov.au/grkn

Or use your phone camera to scan the QR code.



Cucumber



Eggplant



Okra

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Department of **AGRICULTURE AND FISHERIES**

Quản lý tuyến trùng nốt sần hại ổi

(Guava root-knot nematode management)



Giới thiệu

Tuyến trùng nốt sần hại ổi (GRKN), *Meloidogyne enterolobii*, là một loại giun tròn ký sinh thực vật siêu nhỏ, được tìm thấy chủ yếu ở các vùng nhiệt đới. Nó có phổ ký chủ rộng bao gồm nhiều loại cây trồng làm vườn quan trọng, cây cảnh và một số loài cỏ dại.

Lần đầu tiên phát hiện GRKN ở Úc là vào tháng chín năm 2022, trên một số khu đất ở khu vực Darwin mở rộng. Hiện nay nó đã được phát hiện ở Queensland. Mặc dù nhiều loài *Meloidogyne* khác đã có mặt ở NT (*M. javanica*, *M. incognita*, và *M. arenaria*), GRKN được coi là đáng kể vì phổ ký chủ rộng của nó , tốc độ sinh sản cao và tác động đến năng suất của các loại cây trồng ký chủ ưa thích.

Vật chủ

GRKN có một loạt các vật chủ. Một số cây trồng là vật chủ ở NT được liệt kê dưới đây.

Chuối	Ớt	Cà tím	Ổi	Cải thìa	Đậu nành
Cải chíp	Ớt	Sung	Mít	Đu đủ	Khoai lang
Bắp cải	Bông	Cải làn	Dưa	Bí ngô	Cà chua
Tầm bóp	Dưa chuột	Riềng	Đậu bắp	Đậu đũa	Bí ngòi

Quản lý tuyến trùng nốt sần hại ổi

Triệu chứng

Các triệu chứng điển hình của nhiễm GRKN bao gồm các u cục trên rễ, được gọi là nốt sần. Cây thân củ cũng có thể bị hư hại. Phía trên mặt đất, cây có thể có màu vàng, còi cọc và héo rũ. Các tác động của GRKN thường có thể bị nhầm lẫn với tình trạng thiếu nước hoặc chất dinh dưỡng, vì vậy điều quan trọng là phải kiểm tra rễ của bạn để tìm dấu hiệu của sâu bệnh.

Lây lan

Tuyến trùng không thể tự di chuyển đi xa. Con người đóng một vai trò lớn trong việc lây lan và xâm nhập của chúng vào các khu vực mới. Chúng có thể lây truyền qua vật liệu thực vật bị nhiễm bệnh, chẳng hạn như nụ, củ, rễ và qua đất bị ô nhiễm. GRKN có thể đi nhờ trên ủng, dụng cụ và thiết bị nông nghiệp đã chạm vào đất bị nhiễm bệnh.



Rễ bị nhiễm GRKN có các u cục, được gọi là nốt sần.

Quản lý

Quản lý GRKN có thể tốn kém và phức tạp. Nghiên cứu đang được tiến hành để xác định các chiến lược quản lý phù hợp với khu vực. Dưới đây là danh sách những gì chúng ta biết cho đến nay về quản lý ở NT.

An toàn sinh học tại trang trại là cách tốt nhất để giữ GRKN và các RKN khác tránh xa khu đất của bạn!

- ✔ Đến sạch sẽ, đi sạch sẽ

  Bất cứ thứ gì được di chuyển vào khu đất của bạn đều có thể mang theo tuyến trùng nốt sần.
  Làm sạch giày dép, dụng cụ, máy móc và xe cộ trước khi di chuyển giữa các địa điểm.
- ✔ Giám sát người và vật gì đến khu đất của bạn
- ✔ Tìm nguồn cây con và vật liệu trồng sạch bệnh

Lấy mẫu đất và theo dõi cây trồng

Thường xuyên theo dõi các triệu chứng gây hại giúp phát hiện tuyến trùng sớm. Thường xuyên lấy mẫu và kiểm tra đất là chìa khóa để quản lý. Nó sẽ giúp bạn hiểu bạn có những loại sâu bệnh tuyến trùng nào và cách quản lý quần thể.

Quản lý tuyến trùng nốt sần hại ổi

Luân canh cây trồng hoặc đất bỏ hóa

Trồng cây che phủ không phải là vật chủ là cách tốt nhất để giảm quần thể GRKN giữa các vụ cây hàng năm. Nghiên cứu về các loại cây trồng kháng bệnh nhất đang được tiến hành. Một số lựa chọn đã cho thấy khả năng kháng bệnh tốt trong các thí nghiệm bao gồm:

Cao lương làm thức ăn gia súc (một số giống)	Yến mạch (một số giống)	Cỏ Rhodes
Cỏ Signal	Cây điền thanh	Đậu phộng

Đất bỏ hóa không có cỏ dại làm giảm quần thể bằng cách loại bỏ tất cả các nguồn thức ăn cho tuyến trùng và phơi các lớp đất trên cùng ra tác động làm nóng/khô của mặt trời. Việc loại bỏ tất cả cỏ dại và cây dại là rất quan trọng để đất bỏ hóa trở thành một chiến lược quản lý hữu ích.

Quản lý cỏ dại

Việc loại bỏ cỏ dại là rất quan trọng vì một số loại cây này là vật chủ của GRKN và duy trì quần thể trên đồng ruộng.

Bổ sung chất hữu cơ

Bổ sung chất hữu cơ, chẳng hạn như lớp phủ, phân trộn và phân xanh, là một cách để tăng cường hoạt động của vi sinh vật đất, có thể tăng cường quần thể của các loài ăn thịt và ký sinh trùng của tuyến trùng.

Xử lý hóa học

Có thể cân nhắc sử dụng thuốc trừ tuyến trùng kết hợp với các biện pháp quản lý dịch hại tổng hợp (IPM). Trước khi sử dụng hóa chất, nên thực hiện đếm tuyến trùng và/hoặc xét nghiệm DNA để xác định loài gây hại và ước tính quần thể. Kiểm tra cơ sở dữ liệu APVMA để biết các hóa chất đã đăng ký, đọc nhãn và tuân thủ thời gian cách ly.

Để biết thêm thông tin

Liên hệ: (08) 8999 2218 hoặc plant.pathology@nt.gov.au để biết các yêu cầu cụ thể về mẫu.

Truy cập nt.gov.au/grkn

Hoặc dùng điện thoại của bạn để quét mã QR dưới đây


Cucumber


Eggplant


Okra

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Department of **AGRICULTURE AND FISHERIES**

เอกสารข้อเท็จจริง

การจัดการไส้เดือนฝอยรากปมของฝรั่ง (Guava root-knot nematode management)



คำนำ

ไส้เดือนฝอยรากปมของฝรั่ง (GRKN) หรือ *Meloidogyne enterolobii* เป็นพยาธิไส้เดือนที่เป็นปรสิตพืช ซึ่งมีขนาดเล็กมาก-จนมองไม่เห็นด้วยตาเปล่า ส่วนใหญ่พบในพื้นที่เขตร้อนชื้น มีพืชอาศัยสำคัญที่เกาะอยู่หลากหลายชนิดรวมถึง พืชสวน ไม้ประดับ และ วัชพืชบางชนิด

การตรวจพบไส้เดือนรากฝอยของปมฝรั่ง หรือ GRKN ครั้งแรกในออสเตรเลียเกิดขึ้นในเดือนกันยายน ปี 2022 บนที่ดินหลายแห่งในเขตและภูมิภาคนครดาร์วิน ซึ่งตอนนี้มีการตรวจพบในรัฐควีนส์แลนด์แล้ว ในขณะที่ *Meloidogyne* สายพันธุ์อื่นหลายชนิดที่มีอยู่ในนอร์เทิร์นเทร์ริทอรีแล้ว (อันได้แก่ *M. javanica*, *M. incognita*, และ *M. arenaria)* GRKN ยังถือเป็นศัตรูพืชที่สำคัญ เนื่องจากมีพืชอาศัยหลากหลายชนิด มีอัตราการแพร่พันธุ์สูงและส่งผลกระทบต่อผลผลิตในพืชอาศัยที่มันเกาะอยู่

พืชอาศัย(Hosts)

GRKN มีพืชอาศัยหลากหลายชนิด โดยพืชอาศัยบางชนิดในนอร์เทิร์นเทร์ริทอรีมีดังนี้

กล้วย	พริกหวาน	มะเขือม่วง	ฝรั่ง	ผักกาดกวางตุ้ง	ถั่วเหลือง
ผักกวางตุ้งฮ่องเต้	พริก	มะเดื่อฝรั่ง	ขนุน	มะละกอ	มันเทศ
กะหล่ำปลี	ฝ้าย	คะน้า	แตงเมลอน	ฟักทอง	มะเขือเทศ
เคพกูสเบอร์รี	แตงกวา	ข่า	กระเจี๊ยบเขียว	ถั่วฝักยาว	บวบซูกินี

การจัดการไส้เดือนฝอยรากปมของฝรั่ง

อาการ

การเกิดปุ่มปมเป็นก้อนบนรากที่เรียกว่า กอลล์ (Gall) พืชหัวใต้ดินก็อาจได้รับความเสียหายได้เช่นกัน ส่วนเหนือพื้นดินพืชอาจแสดงอาการใบเหลือง แคระแกร็น โตช้า และ เหี่ยวเฉา

ผลกระทบจาก GRKN มักถูกเข้าใจผิดว่าเกิดจากการขาดน้ำหรือขาดสารอาหาร ดังนั้นจึงควรตรวจสอบระบบรากของต้นไม้ว่ามีสัญญาณของศัตรูพืชหรือไม่

การแพร่กระจาย

ไส้เดือนฝอยไม่สามารถเคลื่อนที่ไปได้ไกลด้วยตัวเอง มนุษย์มีบทบาทสำคัญในการแพร่กระจายและนำเดือนฝอยเข้าสู่พื้นที่ใหม่ โรคนี้สามารถแพร่กระจายได้โดยผ่านส่วนของพืชที่ติดเชื้อ เช่น หน่อหัวใต้ดินและราก รวมไปถึงผ่านดินที่ปนเปื้อนโดยที่ GRKN สามารถติดไปกับรองเท้าบูต เครื่องมือ และอุปกรณ์ การเกษตรที่สัมผัสกับดินที่ปนเปื้อนได้





รากที่มีการระบาดของ GRKN จะมีปุ่มปมเป็นก้อนที่เรียกว่า กอลล์ (Gall)

การจัดการ

การจัดการกับ GRKN อาจมีค่าใช้จ่ายสูงและซับซ้อน ขณะนี้มีการวิจัยเพื่อกำหนดกลยุทธ์การจัดการที่เหมาะสมในแต่ละภูมิภาค ด้านล่างนี้เป็นรายการของสิ่งที่เราทราบเกี่ยวกับการจัดการในนอร์เทิร์นเทร์ริทอรีจนถึงตอนนี้

การรักษาความปลอดภัยทางชีวภาพในฟาร์มถือเป็นวิธีที่ดีที่สุดในการป้องกัน GRKN และไส้เดือนฝอย RKN ชนิดอื่นๆ ให้ออกจากที่ดินของคุณ!

- ✔ เวลาจะมาก็ทำความสะอาด เวลาจะไปก็ทำความสะอาด
  สิ่งใดที่เคลื่อนย้ายเข้ามาในที่ดินของคุณอาจนำพาไส้เดือนฝอยรากปมมาได้ ให้ทำความสะอาดรองเท้า เครื่องมือ เครื่องจักรและยานพาหนะก่อนเคลื่อนย้ายระหว่างพื้นที่
- ✔ การเฝ้าระวังว่าจะมีใครและสิ่งใดเข้ามายังที่ดินของคุณ
- ✔ ค้นหาพันธุ์กล้าและวัสดุปลูกพืชที่สะอาดปลอดเชื้อ

การสุ่มเก็บตัวอย่างดินและการตรวจเฝ้าระวังพืชผล

การตรวจหาอาการของความเสียหายจะช่วยให้ตรวจพบไส้เดือนฝอยได้แต่เนิ่นๆ การสุ่มเก็บตัวอย่าง และ การทดสอบดินอย่างสม่ำเสมอเป็นสิ่งสำคัญในแง่การจัดการ ซึ่งจะช่วยให้คุณเข้าใจว่ามีศัตรูพืชประเภทไส้เดือนฝอยชนิดใด และ จะจัดการกับประชากรของมันอย่างไร

การจัดการไส้เดือนฝอยของรากปมฝรั่ง

การปลูกพืชหมุนเวียนหรือการปล่อยให้ที่ดินว่าง

การปลูกพืชคลุมดินที่ไม่ใช่พืชอาศัยถือเป็นวิธีที่ดีที่สุดในการลดจำนวนประชากรของ GRKN ระหว่างการปลูกพืชฤดูกาล การวิจัยเกี่ยวกับพืชที่ต้านทานไส้เดือนฝอยได้ดีที่สุดยังคงดำเนินอยู่ ด้านล่างคือตัวเลือกบางชนิดที่แสดงความต้านทานที่ดีในการทดลอง

ข้าวฟ่างอาหารสัตว์ (บางพันธุ์)	ข้าวโอ๊ต (บางพันธุ์)	หญ้าโรดส์
หญ้าซิกนัล	ปอเทือง	ถั่วลิสง

การปล่อยให้ที่ดินว่างโดยปราศจากวัชพืชจะช่วยลดประชากรไส้เดือนฝอยโดยเป็นการกำจัดแหล่งอาหารของมัน ทั้งหมด และทำให้ชั้นหน้าดินได้สัมผัสกับความร้อน/ถูกทำให้แห้งจากแสงแดด
การควบคุมวัชพืชและพืชที่ขึ้นตามธรรมชาติทั้งหมดถือเป็นสิ่งสำคัญสำหรับการปล่อยที่ดินว่างเพื่อให้เป็นกลยุทธ์การจัดการที่มีประสิทธิภาพ

การจัดการวัชพืช

การควบคุมวัชพืชเป็นสิ่งสำคัญเนื่องจากพืชบางชนิดเป็นพืชอาศัยของ GRKN และ เป็นตัวรักษาประชากรของมันไว้ในแปลงปลูก

การปรับปรุงดินด้วยอินทรีย์วัตถุ

การปรับปรุงดินด้วยอินทรีย์วัตถุ เช่น ใช้วัสดุคลุมดิน ปุ๋ยหมักและปุ๋ยพืชสด เป็นวิธีหนึ่งในการเพิ่มการทำงานของจุลินทรีย์ในดิน ซึ่งสามารถช่วยเสริมสร้างประชากรของสิ่งมีชีวิตที่เป็นผู้ล่าและเป็นปรสิตของไส้เดือนฝอยได้

การใช้สารเคมีบำบัด

สารกำจัดไส้เดือนฝอยอาจถูกพิจารณาใช้ร่วมกับแนวทางการจัดการศัตรูพืชแบบผสมผสาน (IPM) โดยก่อนใช้สารเคมี เราขอแนะนำให้ทำการตรวจนับจำนวนไส้เดือนฝอย และ/หรือ ทดสอบ DNA เพื่อระบุชนิดและประมาณจำนวนประชากร ตรวจสอบฐานข้อมูลของ APVMA สำหรับสารเคมีที่ขึ้นทะเบียน อ่านฉลากผลิตภัณฑ์ และ ปฏิบัติตามช่วงเวลาระยะก่อนการเก็บเกี่ยวอย่างเคร่งครัด

หากต้องการข้อมูลเพิ่มเติม

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ไปที่ nt.gov.au/grkn







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Hort Innovation VEGETABLE FUND

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Department of **AGRICULTURE AND FISHERIES**

Biosecurity

ការគ្រប់គ្រងដង្កូវនីម៉ាថូដ



សចេក្តីផ្តើម

ពពួកដង្កូវដលែយករុក្ខជាតិជាជម្រក (GRKN) ហៅថាមឡែយដូជីន អនែថីរ៉ូឡូបី (Meloidogyne enterolobii) គឺជាប៉ារ៉ាសីត

ដលែចូរីនយើញមាននាក្នុងតំបន់តូរពិច។ ក្រុមប៉ារ៉ាសីតទាំងនេះជ្រកអាស្រ័យតាមរុក្ខជាតិជាចូរីនបុរកទេ រួមមានសាកវប្បកម្មមដំណាំផ្ដល់ផ្លែសំខាន់ៗជាចូរីន, រុក្ខជាតិដាំលម្អ និងពពួកស្មៅនិងរុក្ខជាតិមួយចំនួនដទទៀត។

ការរកឃើញដំបូងនពៃពួកដង្កូវ GRKN នាក្នុងបុរទសេអូស្ត្រាលី គឺនាក្នុងខកែញញាឆ្នា 2022 នាក្នុងចម្ការមួយចំនួននាតំបន់ greater Darwin ។ ឥឡូវនេះគេក៏ហនរកឃើញដង្កូវទាំងនេះនាក្នុងរដ្ឋបំឃ្រីនស្លនែដ៏ផងដរែ។ នាគ្រាដលែអំបូរដង្កូវមឡែយដូជីន (Meloidogyne) ដទជៅចូរីន (M. javanica, M. incognita, និង M. arenaria) ហនបង្ហាញ

វត្តមាននាដនែដី NT នាៈ ពពួកដង្កូវ GRKN នេះ ត្រូវគចោត់ទុកថាជារឿងធំដុំ ដាយសារតពួកវាអាចរស់នាអាស្រ័យលើរុក្ខជាតិចូរីនយ៉ាងហើយអត្រាកកើតកូនចារបស់ពួរនដង្កូវនេះទៀតសាត ក៏មានកម្រិតខ្ពស់ ថមែទាំងបណ្តាលឱ្យមានការប៉ះពាល់ដល់ទិន្នផលដំណាំដលែពួកវាចូលចិត្តរស់នាពឹងអាស្រ័យទៀតផង។

ពពួករុក្ខជាតិជម្រក

ដង្កូវ GRKN មានរុក្ខជាតិជម្រកចូរីនបុរកទេ។ ខាងក្រាមនេះគឺជាដំណាំរុក្ខជាតិខ្លះៗនាដនែដី NT ។

ចកេ	ម្ទេសេបុលាក	ត្រប់រងែ	ត្របកែ	ស្ពតៀ	សណ្ដកែសៀង
ស្ពសៃ	ម្ទេសេហីរ	ល្វា	ខ្នុរ	ល្ហុង	ដំឡូងជ្វា
ស្ពកែ្ដាប	កប្បាស	ខាត់ណា	ពួកត្រសក់ផ្អមែ/melon	ល្ពា	ប៉ងៃប៉ោះ
ប៉ងៃប៉ោះពុរៃ	ត្រសក	រំដងៃ	ពាតហារាំង	សណ្ដកែកួរ	ននាងហារាំង

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រាគសញ្ញា

រាគសញ្ញាបង្កដោយពពួកដង្កូវ GRKN រួមមានការដុះដុំគីសឬដុំពកនៅនឹងឫសនរុក្ខជាតិដលែឆ្លងរាគ ដលែគហៅថាគឹង។ ដំណាំមីមក៏អាចរងគ្រោះខ្លួចខាតផងដរែ។ ផុតពីដីឡឹងទៅ រុក្ខជាតិអាចមើលទៅឡឹងពណ៌លឿង កុរិន និងសុវិតខ្សោះខ្សាយ។ ផលប៉ះពាល់នៃ GRKN ជាញឹកញយអាចចុះឡឹទៅនឹងកង្វះទឹកឬជីវជាតិ។ ដូចុនេះការឆកែមើលឫស ជាកិចុចការសំខាន់ ដឹមុបីរកមើលសញ្ញានសៃមាសភាពចង្អុរទៅំងនេះ។

ការឆ្លងរាលដាល

ដង្កូវនីម៉ាថូដ (Nematode) មិនអាចចល័តឆ្លងាយដាយខ្លួនឯងហានទ។ មនុស្សដីរតួនាទីយ៉ាងធំកុនុងការពាំនាំចមុលងសតុវចង្អុរទៅំងនេះ ទាកាន់ទីកនុលងែចុម្ងៗទៀត។ ពពួកដង្កូវទាំងនេះឆ្លងតាមរយៈគ្រឿងបរិកុខារដលែគបើរកុនុងការបំពញេកិចុចការជាមួយរុក្ខជាតិដលែមានសមាសភាពចង្អុរទៅំងនេះ មានដូចជាមីមផ្ទកា មីមដំណាំ ពុរមទាំងឫសរុក្ខជាតិ និងតាមរយៈដីមានសតុវទាំងនេរែស់នៅ។ ដង្កូវ GRKN ក៏អាចចមុលងតាមរយៈស្បែកដីងកវែង គ្រឿងបរដាប់បរដារ និងសមុភារៈប៊ូរីបរាស់នៅកុនុងចមុការ ដលែហានប៉ះពាល់ដីមានដង្កូវនេះ។





ដុំគីសឬដុំពកនៅតាមឫសរុក្ខជាតិដលែឆ្លងរាគ GRKN ដលែគហៅថាគឹង។

ការគ្រប់គ្រង

ការគ្រប់គ្រង GRKN អាចមានលក្ខណៈសុមុគសុមាញនិងចំណាយចុរីន។ ការសិក្សាស្រាវជ្រាវ កំពុងតបែរពឹតទៅ ដឹមុបីកំណត់ឱ្យដឹងនូវិធីសាស្តុរនានាកុនុងការគ្រប់គ្រងឱ្យសមបុរកបទៅតាមតំបន់។ ខាងក្រាមនេះ គឺជាបញ្ជីមួយសុដីពីអ្វីដលែយើងដឹងមកទល់ពលេនេះ ពាក់ព័នុធនិងការគ្រប់គ្រងនៅកុនុុងដនែដី NT។

ជីវសនុតិសុខនៅតាមចមុការ គឺជាវិធីសាស្តុរដ៏បុរពបំែផុត កុនុង ការទប់សុកាត់មិនឱ្យ GRKN និង RKNs ដទទៀត ចូលមកកុនុង ចមុការរបស់លោកអ្នក!

- ចូលសុអាត ចញេសុអាត
- អ្វីក៏ដាយដលែចូលមកដល់ចមុការរបស់លោកអ្នក អាចមានផ្ទុកដង្កូវនីម៉ាថូដ។ ចូរសមុអាតស្បែកជើង គ្រឿងបរិកុខារបុរីបុរាស់ គ្រឿងម៉ាសុីន និងយានយនុតទាំងអស់ មុននឹងចញេពីទីតាំងមួយទៅទីតាំងមួយទៀត។
- ឃុលាំមីលតីនរណា ឬអ្វីខុលះចូលមកចមុការរបស់លោកអ្នក
- ចូររកទិញកូនដំណាំនិងសមុភារៈរុក្ខជាតិដលែគុមានជំងឺ។

ការយកសំណាកដីដាំដំណាំ ដឹមុបីពិនិតុយ និងការឃុលាំមីលដំណាំជាបុរចាំ

។ ការបុរមូលព័ត៌មានពីរាគសញ្ញានកៃារខ្លួចខាត ជួយដល់ការតាមដានរកមើលដង្កូវហានយ៉ាងឆាប់រហ័ស។ ការយកសំណាកដីដាំដំណាំដឹមុបីការធ្វើតសេ្តពិនិតុយមើលជាបុរចាំគឺជាចំណុចសំខាន់នកៃារគ្រប់គ្រង។ ការធ្វើបបែនេះនឹងជួយលាកអ្នកឱ្យយល់ថាបុរភេទដង្កូវចង្អុរមួយណា ដលែមាននៅកុនុងចមុការរបស់លាកអ្នក ហើយក៏ជួយលើកសុទួយការយល់ផងដរែ អំពីរបៀបគ្រប់គ្រងការកីនឡឹងនកៃូនចារបស់ពួកវា។

ការបុដូរឆ្លាស់មុខដំណាំ ឬ ទុកដីឱ្យនៅទំនរមួយរយៈកាល

ការដាំដំណាំរុក្ខជាតិគ្មរបដីដលែដង្កូវ GRKN មិនចូលចិតុត ចន្លោះដំណាំបុរចាំឆ្នាំ គឺជាវិធីដ៏ល្អបំផុតកុនុងការកាត់បន្ថយចំនួនសតុវល្អិតចង្អុរទៅំងនេះ។ ការសិក្សាស្រាវជ្រាវសុដីពីបុរភេទដំណាំដលែអាចទប់រាវាំងសតុវល្អិតទាំងនោះហន កំពុងតបែរពឹតុទៅឡឹយ។ ជមុរីសរុក្ខជាតិមួយចំនួន ដលែហានបង្ហាញនូវការទប់រាវាំង កុនុងគ្រាជ្រវីការពិសោធ រួមមាន៖

ពតហ្វវែរជេ (បុរភេទខ្លះ)	សុរូសាឡឹ (បុរភេទខ្លះ)	សុមាវ៉ូដសេ (Rhodes grass)
សុមាសញ្ញា (Signal grass)	កុរថា (Sunn hemp)	សំណុដកៃដី

ការទុកដីឱ្យនៅទំនរមួយរយៈកាលដាយគុមានសុមាបុរភេទរុក្ខជាតិ កាត់បន្ថយកំណើនសមាសភាពចង្អុរ ដាយការផ្ទុដាច់នូវបុរភពចំណីគ្រប់បបែយ៉ាងពីពពួកដង្កូវនេះ ហើយទុកឱ្យសុរទាប់ដីសើលើទទួលកមុដាពីពនុលើពុរះអាទិតុយ/សមុងួតដាយពុរះអាទិតុយ។ ការទប់សុកាត់កុំឱ្យមានសុមាបុរភេទរុក្ខជាតិឥតបុរយោជន៍ គឺជាកិចុចសំខាន់ កុនុងការទុកដីឱ្យនៅទំនរមួយរយៈកាលដលែជាវិធីសាស្តុរគ្រប់គ្រងដ៏មានបុរយោជន៍។

ការគ្រប់គ្រងដង្កូវនីម៉ាថូដ

ការគ្រប់គ្រងសុមាឬរុក្ខជាតិឥតបុរយោជន៍

ការទប់ស្កាត់កុំឱ្យមានសុមាឬរុក្ខជាតិឥតបុរយោជន៍គឺជាការសំខាន់ ដូចិត រុក្ខជាតិខ្លះគឺជាទីជម្រកអាស្រ័យនៃដង្កូវ GRKN ចម្ការទាំងឆ្នាំឱ្យ មានការបង្កបង្កើតកូនចៅនៅលើទីតាំងដីនោះទៀតផង។

វត្ថុធាតុសរីរាង្គទាំងពួង

វត្ថុធាតុសរីរាង្គទាំងពួង មានដូចជាកម្ទេចឈើ កំប៉ុស្តិ៍ និងកម្ទេច រុក្ខជាតិស្រស់ គឺជាវិធីបង្កើនសកម្មភាពមីក្រូប/មវោគក្នុងដី ដែល អាចជួយជំរុញឱ្យកើនចំនួនពពួកមំសំសត្វ/អជ្ញុឈហាតកសត្វ (សត្វរើ សាច់សត្វដទៃជាអាហារ) និងប៉ារ៉ាសីតទាំងឡាយដែលសីដង្កូវនីម៉ាថូដ (nematode)។

ការកម្ចាត់សត្វចង្រៃដោយប្រើវិធីគីមី

កការប្រើថ្នាំសម្លាប់ដង្កូវនីម៉ាថូដ (nematode) អាចប្រើរួមគ្នាជាមួយនឹង ការគ្រប់គ្រងសត្វល្អិតចង្រៃដោយការគូបផ្សំវិធីសាស្ត្ររួមចំនួន (IPM) ហាន។ មុននឹងប្រើថ្នាំគីមី មានការស្នើសុំឱ្យធ្វើតស្តេឌីអិនអ (DNA) និងការស្ទង់មើលបរិមាណដង្កូវនីម៉ាថូដ (nematode) សិន ដើម្បីធ្វើការ កំណត់អត្តសញ្ញាណនៃសត្វចង្រៃនេះឱ្យហានចូហស់ និងដើម្បីឱ្យ ដឹងពីបរិមាណនៃសត្វនេះ។ ចូរឆ្លៃមើលមូលដ្ឋានទិន្នន័យ (APVMA database) របស់ APVMA ដើម្បីឱ្យយល់ដឹងអំពីថ្នាំគីមីដែលមានការ ចុះបញ្ជីត្រឹមត្រូវ ហើយសូមអានការណែនាំអំពីរបៀបប្រើប្រាស់គីមីនេះ ជាមួយនឹងការយកចិត្តទុកដាក់អំពីរយៈពេលនៃទុំពលថ្នាំ។

ចំពោះព័ត៌មានបន្ថែម



សូមទាក់ទង: 08 8999 2218
ឬអ៊ីមែល plant.pathology@nt.gov.au ដើម្បីសុំសំណាកគំរូ។ ចំពោះព័ត៌មានបន្ថែម សូមមើ
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តុរសក់



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Departemen **PERTANIAN DAN PERIKANAN**

Keamanan hayati

Pengendalian nematoda simpul akar *(Guava root-knot nematode management)*



Pendahuluan

Nematoda simpul akar *(GRKN)*, *Meloidogyne enterolobii*, adalah parasit tanaman cacing gelang mikroskopis, yang terutama ditemukan di daerah tropis. Parasit ini memiliki jangkauan inang *(host)* yang luas, termasuk banyak tanaman hortikultura penting, tanaman hias dan beberapa jenis gulma.

Penemuan *GRKN* di Australia yang pertama terjadi pada bulan September 2022, di beberapa tanah milik di wilayah luar Darwin. Sekarang GRKN ini telah ditemukan di Queensland. Meskipun beberapa jenis *Meloidogyne* lain telah ada di NT (*M. javanica*, *M. incognita*, *dan M. arenaria*), GRKN ini dianggap penting karena jangkauan inangnya yang luas, tingkat reproduksinya yang tinggi, dan dampaknya pada hasil panen tanaman inang pilihan.

Inang

GRKN memiliki jangkauan inang yang luas. Beberapa tanaman inang NT tercantum di bawah ini.

Pisang	Paprika	Terung	Jambu biji	Pak coy	Kedelai
Bok coy	Cabai	Buah Fig	Nangka	Pepaya	Ubi Jalar
Kol	Kapas	Kai lan	Melon	Labu Kuning	Tomat
Beri Emas	Mentimum	Lengkuas	Okra	Kacang Panjang	Timun Jepang

Pengendalian nematoda simpul akar
(Guava root-knot nematode management)

Gejala-gejala

Gejala infeksi *GRKN* yang umum termasuk pembengkakan di akar, yang disebut galls. Tanaman umbi-umbian juga dapat rusak karena ini. Di atas tanah, daun tanaman mungkin tampak menguning, pertumbuhan terhambat dan tanaman tampak layu. Dampak dari *GRKN* ini sering dianggap sebagai kekurangan air atau unsur hara, jadi penting untuk memeriksa akar tanaman Anda terhadap tanda-tanda hama ini.

Penyebaran

Nematoda tidak dapat menyebar sangat jauh dengan sendirinya. Manusia memainkan peran yang besar dalam penyebarannya dan memperkenalkannya ke tempat-tempat baru. Nematoda ini dapat disebarkan melalui bahan tanaman yang telah terinfeksi, seperti umbi dan akar, serta melalui tanah yang telah terkontaminasi. *GRKN* dapat menempel pada sepatu lars, alat-alat dan peralatan pertanian yang telah menyentuh tanah yang telah terserang penyakit.



Pembengkakan akar yang terinfeksi GRKN, yang disebut galls.

Pengendalian

Pengendalian *GRKN* dapat memakan biaya yang besar dan rumit. Saat ini sedang dilakukan penelitian untuk menentukan strategi pengendalian yang cocok untuk masing-masing daerah. Di bawah ini adalah daftar tentang pengendalian di NT yang kami ketahui sejauh ini.

Keamanan hayati di lokasi pertanian adalah cara terbaik untuk mencegah *GRKN* dan *RKN-RKN* lainnya keluar dari tanah milik Anda!

- Datang bersih, keluar juga bersih
- Apa pun yang dipindahkan ke tanah milik Anda dapat membawa nematoda simpul akar. Bersihkan alas kaki, alat-alat, mesin-mesin dan kendaraan sebelum pindah di antara lahan-lahan.
- Pantau siapa dan apa yang masuk ke tanah milik Anda.
- Cari sumber bibit dan bahan tanaman yang bersih.

Pengambilan sampel tanah dan pemantauan tanaman pertanian

Mencari gejala kerusakan dapat membantu Anda mendeteksi nematoda secara dini. Dengan melakukan pengambilan sampel tanah dan pemeriksaan secara rutin, penting bagi pengendalian. Hal ini akan membantu Anda untuk mengetahui hama nematoda mana yang Anda miliki dan bagaimana cara mengendalikan populasinya.

Rotasi tanaman atau lahan kosong

Menanam tanaman penutup non-inang adalah cara terbaik untuk mengurangi populasi *GRKN* antara tanaman tahunan. Penelitian untuk mendapatkan tanaman pertanian yang paling tahan terus berlangsung. Beberapa tanaman pilihan yang telah menunjukkan pertahanan yang bagus dalam beberapa percobaan termasuk:

Sorgum ternak (beberapa jenis)	Gandum (beberapa jenis)	Rumput Rhodes
Rumput sinyal	*Sunn hemp* (Rami coklat)	Kacang tanah

Lahan kosong tanpa gulma dapat mengurangi populasi dengan menghilangkan semua sumber makanan bagi nematoda serta dapat memanaskan dan mengeringkan bagian atas tanah dengan tenaga surya. Menindas semua jenis gulma dan tumbuhan liar lainnya sangat penting agar lahan kosong menjadi strategi pengendalian yang berguna.

Pengendalian nematoda simpul akar
(Guava root-knot nematode management)

Managing weeds

Penindasan gulma ini penting dilakukan karena beberapa tanaman ini merupakan inang dari GKRN dan mempertahankan populasinya di ladang.

Amandemen organik

Amandemen organik seperti pemakaian mulsa, kompos dan pupuk kandang hijau, merupakan cara untuk meningkatkan kegiatan mikroba tanah, yang dapat meningkatkan populasi pemangsa dan parasit bagi nematoda.

Pengobatan dengan Zat Kimia

Nematisida dapat dipertimbangkan dengan menggabungkannya dengan praktik-praktik pengendalian hama terpadu (*IPM*). Sebelum menggunakan zat kimia, direkomendasikan untuk melakukan penghitungan jumlah nematoda dan/atau tes DNA untuk mengenali jenis hama dan perkiraan populasinya. Periksalah pangkalan data *APVMA* untuk jenis-jenis zat kimia yang terdaftar, baca labelnya dan perhatikan masa penangguhannya.

Untuk informasi lebih lanjut

Hubungi: 08 8999 2218 atau plant.pathology@nt.gov.au untuk pertanyaan khusus tentang contoh-contoh.

Kunjungi nt.gov.au/grkn

Or use your phone camera to scan the QR code.



Mentimum



Terung



Okra

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Root-Knot Nematodes (RKNs)

Introduction

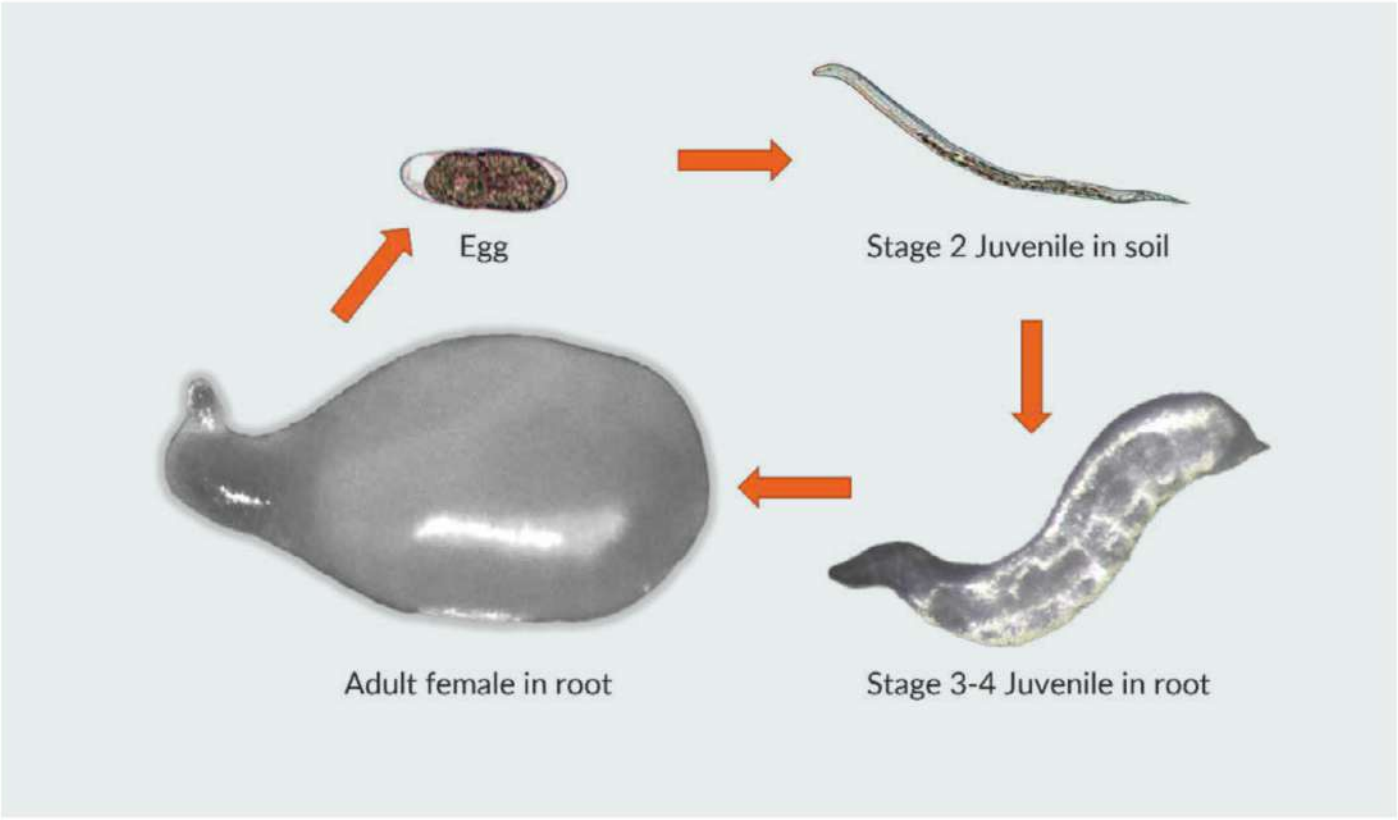
Root-knot nematodes (RKNs) are microscopic plant-parasitic round worms. There are four species commonly found in the Northern Territory, and all are polyphagous, meaning they feed on many hosts, including horticultural crops, ornamentals and weeds. They can cause extensive damage to crop-, garden- and bushland plants. RKNs prefer moist, courser textured (sandy) soils, especially under irrigated conditions and/or wet season.

The four root-knot nematode species commonly found in the Northern Territory are:

Meloidogyne arenaria	*Meloidogyne enterolobii*	*Meloidogyne incognita*	*Meloidogyne javanica*
Peanut root-knot	Guava root-knot	Southern root-knot	Javanese root-knot

Lifecycle

Understanding the lifecycle of a RKN is important as many management practices target eggs and juvenile worms in the soil but are less effective against adult females within the roots. RKNs hatch from eggs as tiny juvenile worms, less than half a millimetre in length. They travel through the soil to find host plants and burrow inside the roots, damaging the vascular tissue and forming lumpy and knotted structures, called galls. Once inside the root, they begin to grow and change shape. The females swell into a balloon shape and produce up to a thousand eggs, mostly by cloning themselves, through a process called parthenogenesis. Under Northern Territory tropical and subtropical soil conditions, the lifecycle can repeat every four to six weeks. Starting with a single female, if only 10% of the eggs hatch and survive to adulthood, over 1 million adult female RKNs can be produced after three months.



For more information

Contact: 08 8999 2218 or
plant.pathology@nt.gov.au for sample specific enquires

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Symptoms

As the RKNs feed, they can cause nutritional and water deficiencies in plants. Symptoms often present as yellowing, wilting and/or stunting of plants above ground. Below ground, roots and tubers often show lumpy growths, called galls. If you suspect RKNs are a problem, check your roots for signs of the pest galling.

NOTE: The roots of legumes can contain Rhizobium nodules, which are beneficial structures created by bacteria and help convert Nitrogen in the soil and make it available for plants. Nodules are often spherical and easily pop off legume roots, while RKN galls are lumpy, hard and cannot be removed. RKN galls DO NOT help plant roots.



RKN infested root systems.
(A) Carrot infested with M. javanica; (B) Okra infested with M. incognita; (C) Eggplant infested with M. enterolobii; (D) Table grape infested with M. arenaria at 3.5 x magnification.
Note arrows point to the exposed adult females.

Hosts

Root-knot nematodes have broad host ranges. Some species prefer one crop over another. Below is a list of crops in the NT that host one or more species of RKNs. This list is not exhaustive, and many more crops may be hosts.

Banana	Carrot	Chilli	Hairy Melon	Mung Bean	Silverbeet	Table grape
Basil	Cassava	Cowpea	Hog Plum	Okra	Snake Bean	Tomato
Bitter Melon	Cavalcade	Cucumber	Kailan	Papaya	Snow pea	Zucchini
Brazilian Spinach	Cauliflower	Eggplant	Long Melon	Passionfruit	Sunflower	
Broccoli	Celery	Fig	Milgarra Pea	Pineapple	Sunn Hemp	
Calendula	Citrus	Guava	Mulberry	Pumpkin	Sweet potato	

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Spread

RKNs cannot move very far on their own. Humans play a big role in their spread and introduction into new areas. In the NT, they are often transmitted through the sharing of infested plant and propagation material, such as roots, bulbs, tubers, setts, slips and contaminated soil. Egg masses are microscopic, very sticky and are easily moved to new areas. Eggs can hitchhike in soil on boots, tools and farm equipment that has had contact with infested soil and/or roots. Home gardens are often a source of RKNs and can be unintentionally spread to commercial farms by worker's footwear.

Additionally, RKNs infestations can spread from perennial crops with extensive root systems (e.g., fruit trees) to nearby annual crops and weeds. These mixed perennial and annual production systems are difficult to manage due to RKN population reservoirs in the perennial crop roots.

Management



Management of RKNs can be costly and complex. Integrated Pest Management (IPM) practices involving cultural, chemical and biological methods can be more successful than a single approach.

On-farm biosecurity is the best was to keep RKNs out of your property!

- Come clean, go clean

Anything moved into your property may carry root-knot nematodes. Clean footwear, tools, machinery, and vehicles before moving between sites.

- Monitoring who and what comes to your property
- Source clean seedlings and plant material

Soil sampling and crop monitoring

Scouting for symptoms of damage helps to detect nematodes early. Regular soil sampling and testing is key to management. It will help you understand which nematode pests you have and how to manage populations.

Crop rotation or bare fallows

Cultivating a non-host cover crop is an excellent way to reduce RKN populations between annual crops. Research on the most resistant crops is ongoing as only specific varieties have resistance. Some options that have shown good resistance under NT conditions include:

Forage sorghum varieties Jumbo and Pronto	Rhodes grass varieties Callide and Katambora	Signal grass	French marigolds (Tagetes patula)

Sunn hemp and Cavalcade are both susceptible to some RKNs in the NT and are not recommended. Milgarra butterfly pea is slightly susceptible to some species of RKNs and may be an appropriate legume depending on the species of RKN detected and level of infestation.

Weed-free bare fallows reduce populations by removing all food sources for the nematodes and exposing the upper layers of the soil to heating/drying action of the sun. Suppressing all weeds and volunteers is critical for bare fallows to be a useful management strategy.

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Managing weeds

Many common weeds in the NT are RKN hosts and can maintain populations of RKN between crop rotations and/or in inter-rows. Pulling weeds and examining their roots can help you understand where RKNs are a problem. Below is a list of common weed hosts of RKN in the NT.

SCIENTIFIC NAME	COMMON NAME
Calopogonium mucunoides	Calopo
Cucumis melo subsp. agrestis	Paddy Melon
Euphorbia heterophylla	Asthma Plant
Euphorbia hirta	Milkweed
Oldenlandia corymbosa	Diamond Flower
Passiflora foetida	Native Passionflower
Physalis angulata	Gooseberry
Stachytarpheta sp.	Snakeweed
Tridax procumbens	Tridax Daisy



Calopo weed with galled roots caused by *M. enterolobii*.

Organic amendments

Organic amendments, such as mulch, compost and green manures, can increase the activity of soil microbes and enhance the populations of predators and parasites of nematodes. Building soil health and biodiversity can help suppress RKNs by supporting increased population of natural enemies in the soil. It can also increase plant available nutrients in the soil.

Chemical treatment

Nematicides may be considered in combination with IPM practices. Prior to chemical application, it is recommended that nematode counts and/or DNA tests are performed to identify the pest and estimated population. The timing of application is crucial as many chemicals can only be applied pre-planting. Check the APVMA database for registered chemicals, read labels, and observe withholding periods.



Mung bean root heavily galled with *M. javanica*.

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