

The unseen vegetable killer

Dear Reader,

If past newsletters were not enough, with various fusariums etc., wreaking havoc upon crops, this issue includes an article on yet another lurking predator of plants – Root Knot Nematode. Nematodes are worms, they just don't confine themselves to infesting the internals of livestock and pets, they also have serious implications for horticulture. Local Departmental researcher Barry Conde and peers from CSIRO have recently documented the presence of this pest in Asian vegetable crops around Darwin. Yes, not good news, but certainly a good read to begin to find out more about these pests and how to manage them.



Also in this issue, a short summary of some research conducted to compare the performance of certain table grape lines in a CSIRO national breeding program. It seems taste does matter!

Knowing what's going on out there and getting the right information, is the foundation for making the right agri-business decisions. Don't miss our useful links and our upcoming events section. We have a few things happening in the fodder and mango sectors in the coming weeks so be on the lookout and get involved.

Regards,

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Root Knot Nematode: symptoms and diagnosis of an important pest of vegetables in the Northern Territory

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Root Knot Nematodes (RKN) are microscopic roundworms of the genus *Meloidogyne* which infect a wide range of crop plants and inflict severe damage to susceptible plants. With damage thresholds of 1- 2 nematode(s) per gram of soil, *M. incognita* is one of the most destructive species of RKN worldwide. It was recently identified from diseased Bitter Melon root samples taken from a farm at Humpty Doo, Darwin in September, 2011. The root systems of the plants were totally heavily infected with RKN and exhibited forming large coalescing root galls (Fig. 1).

Meloidogyne species have been recorded from the Northern Territory on various hosts including Bitter Melon, Snake Beans, Okra, Angled Luffa (sinqua), Smooth Luffa, and Sweet Basil. RKN can become a serious problem in the production of Asian vegetables (Conde *et al.* 2005). In addition to direct damage, *M. incognita* is able to form disease complexes with fungal pathogens such as *Fusarium* sp. and can exist in mixed populations with other *Meloidogyne* sp.

Root-galls

RKN infection can be diagnosed by direct examination of the root system for characteristic galls. The galls are outgrowths of the roots themselves and can be differentiated from root nodules by rubbing the galls between fingers. Root nodules come off easily while root-galls do not.

Heavy RKN infection can cause stunting and rot in roots resulting in plant death. The absence of root-galls on root system does not always mean that the soil is free from RKN. Soil nematode



Figure 1: Bitter melon plants showing wilting and drying out symptoms in *Meloidogyne incognita* infested field. Photo insert bottom left: Heavy galling of bitter melon root system caused by *Meloidogyne incognita* (Photo credit: Barry Conde; Department of Resources, Northern Territory Government)

extraction or bioassays of soil samples may be necessary when RKN populations are below detectable levels at the time of sampling.

Visual symptoms

The above-ground symptoms of RKN infection include poor or patchy growth, yellowing of leaves, reduction in the number of leaves, reduction in flowering, decrease in fruit production and wilting of plants on hot days - very similar to symptoms of water and nutrient deficiency. Typically, these symptoms will occur in patches within a field.

Taking soil samples for nematode assay

Due to patchy distribution of nematodes, soil samples for nematode assays should be aggregated from 15-20 subsamples per farm taken from the root-rhizosphere region of plants from depths up to 30 cm. The best time for sampling is the middle to end of the crop cycle when nematode populations are highest. The soil should be moist and samples must be stored in a cool (below 20 °C), and dry place away from direct sunlight, and transported to the laboratory for nematode analysis within a day or two after sampling.

Bioassay

The bioassay procedure for RKN involves growing a susceptible plant (e.g. tomato, lettuce, cabbage, okra) in the composite soil sample kept in pots for a period of 8 weeks and examining the root system for symptoms of infection. Farmers can use bioassay of soil samples on their farms to determine the presence and severity of RKN infection prior to planting. However, time can be a limiting factor when using the bioassay method as RKN infection results are not available for 6-8 weeks.

Host range

M. incognita is extremely polyphagous (i.e., it likes to live amongst a range of hosts), but the level of host susceptibility varies. In Australia, *M. incognita* has been reported from at least 35 plant families including cucurbits, legumes and solanums (potatoes and tomatoes).

Lifecycle

On average the lifecycle is complete within 6-8 weeks under tropical conditions. Consequently root-knot nematodes are able to complete several generations in one year and population levels can build up rapidly when susceptible crops are grown consecutively. The adult female is sedentary and lives inside the root gall where she feeds, matures and lays 300-500 eggs. The eggs are embedded in a protective gelatinous matrix on the part of the female protruding outside the root. The juveniles undergo the first moult within the egg and hatch out at the second moult. The second stage juveniles are attracted to roots by the chemicals released from roots, and after



entering the roots they undergo a third and then a fourth moult into the adult stage. The females are able to reproduce both parthenogenetically (i.e. without males present), or sexually when males are present.

Management and control

A range of management strategies are available for controlling RKN, such as using nematicides, green manure and soil amendments, rotations using resistant crops and biological control. A number of nematicides have been deregistered due to environmental and health concerns. Nematicides are costly, however, can be justified for high-value crops (e.g., vegetables). The use of green manure (Sudax sorghum) in the Northern Territory and soil amendments (saw dust and chicken manure) by Queensland ginger growers to manage root knot nematodes has had some success and could be investigated further as a management option (Conde *et al.* 2005). The use of crop rotations is a most important strategy though requires careful planning to choose non-host crops. Knowledge about the specific RKN species present is critical for this approach to be effective. Nematode-free planting materials, especially for transplanting and vegetative propagation, and good farm sanitation such as cleaning machinery/equipment before moving between farms can also help reduce the spread of RKN. Weeds can act as reservoir hosts of RKN, thus keeping farms free of weeds can help in keeping the nematode population levels low.

Acknowledgement: The authors would like to acknowledge the support of the Australian Government's Cooperative Research Centres Program.

Reference: Conde B., Pitkethley, R. and Arao Arao, I. (2005) Root Knot Nematode Disease. Information Sheet No. 12, Agdex No: 258/637. Department of Resources, Northern Territory Government.

Table grapes put to the test

Vivek Bhat and Glen Oliver, Plant Industries, Arid Zone Research Institute (AZRI), Alice Springs

Table grape selections from a CSIRO breeding program are being evaluated as part of a national project supported by Horticulture Australia Limited and collaborating agencies in Queensland, the Northern Territory and Western Australia. Taste assessment of four candidate selections from this program was conducted at AZRI in December 2011. Each of the



table varieties were grown on a range of rootstocks and treated with and without gibberellic acid in order to compare and contrast their performance on taste. The grapes were harvested from four-year old vines grown at Ti Tree Research Farm and were chosen from eight other lines of less significance. Fifteen volunteers tasted the grapes and rated in accordance of their preference of most liked to disliked. The ratings have been analysed and presented in Figure 1. The research highlighted those grapes from the new line of varieties i.e. line 'A' were comparable in taste to a popular commercial variety - *Menindee Seedless* which was included as a reference. The line 'A' grapevines were until now, only classified as of medium priority in the National Improvement Program selection trial. The line 'B' grapes had been chosen as the elite line in the program, though on these results these were comparatively 'less liked' (50%) than line 'A' grapes.

This humble investigation proves that taste really does matter!

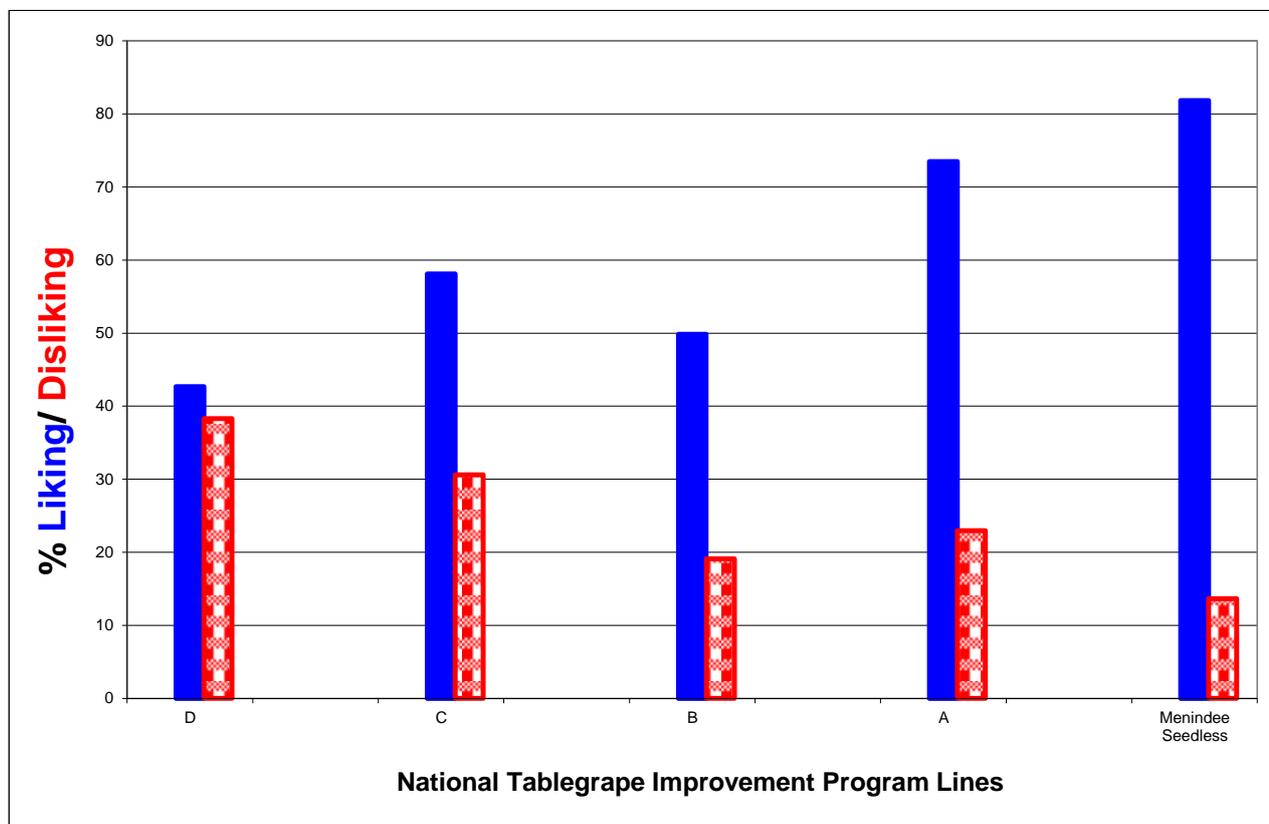


Figure 1: The ranking of grapes based on their taste testing



Useful Links

APVMA – Public Chemical Registration System

<http://services.apvma.gov.au/PubcrisWebClient/welcome.do>

APVMA Permits

<http://www.apvma.gov.au/permits/search.php>

APVMA – Dimethoate Review

http://www.apvma.gov.au/news_media/news/2011/2011-08-22_dimethoate_review.php

Bureau of Meteorology services

- Weekly climate note
<http://www.bom.gov.au/climate/tropnote/tropnote.shtml>
- Madden-Julian Oscillation
www.bom.gov.au/climate/mjo

Horticulture Publications – DAFWA

http://www.agric.wa.gov.au/PC_91713.html?s=505199810

Mango Information Kit

<http://era.deedi.qld.gov.au/1647/>

NT Primary Industries Agnotes and Fact sheets

http://www.nt.gov.au/d/Primary_Industry/index.cfm?Header=Agnotes%20and%20Factsheets

Primary Industries Publications – NT DoR

<http://www.nt.gov.au/d/publications/>

Upcoming Events

Mangoes:

Formation of Mango industry small group networks (Darwin and Katherine), April 2012. Contact Warren Hunt warren.hunt@nt.gov.au to register your interest , or to find out more.

Fodder industry:

1. **Sustainable Farm Practices Field Day**
Douglas Daly, Wednesday 4 April 2012,
8.30 am to 4.30 pm
Meet at the Research Farm , Jungawa Road, Douglas Daly.

Program includes:

Leucaena establishment and grazing; efficient nitrogen use, irrigated pasture evaluation, cell grazing systems, minimum tillage/pasture establishment, the Carbon Farming Initiative.

Morning tea & lunch will be provided. BBQ will follow at Fleming Town site from 6pm.

RSVP by 28th March and for more information contact:

Peter Clifton on 0419 142 835, peter.clifton@ntca.org.au

2. **Workshops at 4 x locations at dates to be advised:**
 - Barkly
 - Katherine
 - Douglas-Daly
 - Darwin

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