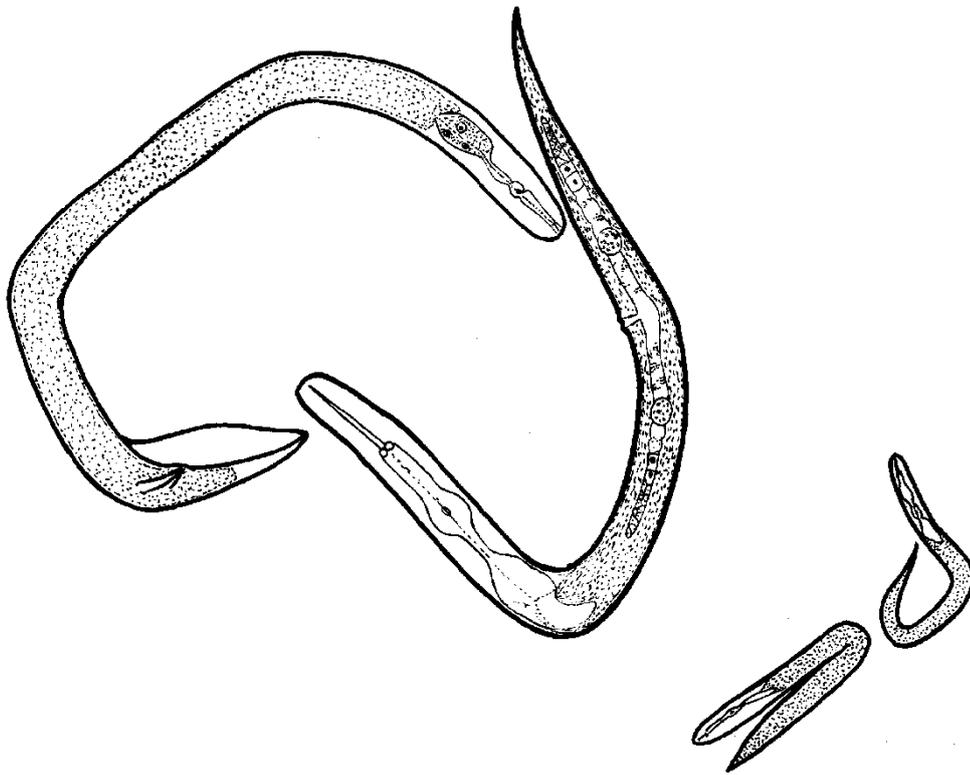


# AUSTRALASIAN NEMATODOLOGY NEWSLETTER



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# From the Editor

Thank you to all those who made contributions to this newsletter.

## **January Issue**

The deadline for the January issue will be the end of December. I will notify you a month in advance so please have your material ready once again.

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# Association News

## FROM THE PRESIDENT

International Congresses of Nematology are held every 6 years, with the last in Cape Town last year. Although still 5 years away, the process has already started for selecting the site for the next Congress, the 7<sup>th</sup>. A call for bids has been issued by the International Federation of Nematology Societies with bids due in early next year. AAN will not be bidding, having hosted the 5<sup>th</sup> Congress in 2008. However, AAN members may wish to know and think about preferred sites. For the last congress, in addition to South Africa, there were strong bids from Japan (Sapporo), China (Beijing) and India (New Delhi), all geographically close to Australia. This may be a factor in willingness to travel, having myself flown to Tenerife in the Canary Islands for the 4<sup>th</sup> Congress (something like 28 hours travel), Guadeloupe in the Caribbean for the 3<sup>rd</sup> Congress (something like 26 hours travel), Veldhoven in The Netherlands for the 2<sup>nd</sup> Congress (2 days as I recall), and Guelph in Canada for the 1<sup>st</sup> Congress (a long time). The final bidders should be known about the time of the next newsletter, so it may pay to actually read it.

Recently, the news came that the Society of Nematologists membership had declined to below 200. Coincident with this comes anecdotal reports of decreasing numbers of positions and departments dedicated to nematology. Increasingly, they are being bundled with Entomology, Plant Pathology or not recognized independently at all. This is cause for some concern, both in the USA and elsewhere.

The concern for a decline in support for nematology is not new. AAN was formed over 25 years ago in response to a general decline in support for nematology. Has there been a continual 30-year decline, or is there no decline, just a concern about decline that is constant?

The evidence, I think, points to a real decline. In addition to the report alluded to above from SoN, there are fewer scientists in general, and spending on R&D has also declined. The question, still after 25 years, is what to do about it.

I think—perhaps naively—that having data and good reasons will ultimately produce results. This is even when having slick presentations for apparently appealing arguments with no factual or logical basis, but which lead to desirable outcomes seems to win the day in the short term. I think that as scientists we should stick to the science because we will never beat the politicians and rhetoricians at their games. And that scientific, supported facts will win in the end.

The upshot of this is that it may be time to consider gathering and amalgamating data on what nematodes do. There have been a number of times this has been done by AAN in the past, most recently after 5ICN in 2008 (see ANN newsletter), and I think the response was positive for support for nematology. There are a number of different audits of capacity going on at the moment in Australia, and so having some data may be useful for them as well. All data around impacts of pests or beneficial services of organisms are to a large extent pretty rough, so if in coming months

you are asked for an estimate of what your favourite nematode does, please give your opinion. I have always thought that nematology suffers because our little beasts are invisible most of the time. Hopefully highlighting their impact may make them more visible, and that can translate into support for nematology.

Other nematological societies like SoN have the same issues, so I am also hoping we can use their data, borrow their materials, and share our experiences.

On the point of visibility, many years ago I used a scanning electron micrograph of a nematode, magnified and overlaid on a picture of people in a boat on the Murray River. (I was working on freshwater nematodes at the time.) The idea was that the single giant nematode represents the size of all the billions of tiny ones put together. That photo is one of the most downloaded photos of nematodes, and was one of the top downloads from the old CSIRO web site. Google “big nematode”. If only a small percentage of people actually think about the message, hopefully that is making a difference. I still think that having 30 metre nematodes roaming around would halt the decline in support for nematology. Genetic engineering anyone? Or just Jurassic Nematode Park? (That is my attempt to be topical.)

By the way, the Australasian Nematologists Newsletter—the present august publication—is considerably older than the AAN. It was originally started to foster communication and information exchange between all the nematologists working at different sites and fields, something of a different issue to having few or no colleagues to communicate with.

On another note, if you have not yet paid your membership fees for this year please do so via

- 1) EFT with your name to Australasian Association of Nematologists, BSB - 012950, Account number – 518007506
- 2) Subscribing through the Australasian Plant Pathology Society
- 3) Requesting an invoice.

*Mike Hodda*

# Regional News

## NEWS FROM SOUTH AUSTRALIA

### SARDI

The team at SARDI has been busy sowing and soil sampling field trials to analyse the tolerance and resistance of cereal, lentil and faba bean varieties to *P. neglectus* as a part of the GRDC funded National Nematology Project. SARDI will further investigate the resistance of canola, chickpea, lentil, pea, faba bean and oats to *P. neglectus* and *P. thornei* in SA by sampling 10 NVT trials.

A newly funded SAGIT project has been sown in the SA Mallee to investigate the interaction between *P. neglectus* and Rhizoctonia. The Syngenta fungicide, Uniform, has been shown to provide yield benefits in soils with high Rhizoctonia. This new trial is investigating whether the fungicide can still achieve these yield benefits in the presence of medium *P. neglectus* populations. In addition, the trial is investigating these effects at three times of sowing in both wheat and barley.

SARDI/ACPGF PhD student Shefat Rahman is nearing the end of his experimental work in his project investigating the *P. thornei* resistance derived from Sokoll. Shefat is eagerly awaiting the results from a metabolomics experiment which is analysing root exudates from the resistant and susceptible parental lines in addition to lines only containing the resistance loci, *QRInt.sk-2B* and lines with only *QRInt.sk-6D*.

As part of a GRDC funded project to improve molecular diagnostics for disease management we have been sequencing plant parasitic nematodes, primarily *Pratylenchus* from soils that have been submitted to the SARDI molecular diagnostic centre. Soil has been sub sampled from PreDicta B, national variety trials and national paddock survey samples to give us a good coverage of the cropping regions. The project aims to investigate variation within the *Pratylenchus* genera to ensure that the *Pratylenchus* DNA tests are quantifying all of the targeted species.

*Katherine Linsell and Paul Bogacki*

### The University of Adelaide

In late June, Kerrie Davies will travel to Germany and the UK to see family and catch up with Adrian Evans (who is recovering from heart surgery), Suzanne Charwat and Andreas Hensel. In July, she will fly to Michigan, USA to attend the 54<sup>th</sup> meeting of the Society of Nematologists' in Lansing. She will present an invited paper called 'Tri-trophic co-evolution in the *Fergusobia/Fergusonina/Myrtaceae* – a yarn from Down Under' as part of a symposium on 'Using Model Systems For Modernizing and Integrating Nematode Systematics'.

*Kerrie Davies.*

## NEWS FROM QUEENSLAND

### University of Southern Queensland

Since completing the European Masters of Science in Nematology course at Ghent University in Belgium, I have returned to Australia and commenced a PhD at the University of Southern Queensland in Toowoomba. I will be working in collaboration with CIMMYT in Turkey, and focussing on the mechanisms of action of wheat resistance QTL to *Pratylenchus thornei* and *Pratylenchus neglectus*, under the supervision of Stephen Neate, Kirsty Owen, Julie Nicol and Amer Dababat.

As my PhD is also being supported by the Grains Research and Development Corporation (GRDC), I was fortunate to attend the National Nematology Meeting in Sydney in March this year. I also attended the annual CAIGE meeting and the Australian Wheat and Barley Molecular Marker Program meeting in Adelaide in April. Following these meetings, Katherine Linsell was kind enough to show me the SARDI facilities and Grant Hollaway, and some of his team, gave us a tour of the facilities at Horsham, including the amazing Australian Grains Genebank. These experiences gave me the opportunity to see the positive collaboration which is occurring across Australia to address the most important nematological issues facing Australian agriculture. It was also great to finally be able to put some faces to some names! I look forward to again catching up with my peers within the supportive network in which we are all involved.

*Lea Meagher*

## NEWS FROM VICTORIA

### Horsham

The nematology program at Horsham is half way through its sowing program for 2015. Despite the dry start to the season we have just received 10mm of rain in the last 24 hours (5<sup>th</sup> June) and we remain optimistic for an average season. During 2015, there are 35 field trials being sown in the Wimmera and Mallee investigating root lesion (*Pratylenchus neglectus* and *P. thornei*) and cereal cyst nematode. This year's program introduced yield loss screening for Canola and Chickpeas to add to the lentil and field pea screening that commenced in 2014. Further to this, Beans (faba and broad) are being screened for resistance to root lesion nematodes for the first time in the Wimmera.

During February 2015, *P. neglectus* and *P. thornei* resistance ratings for field peas and lentils were released for the first time in Victoria. These ratings will assist growers in managing nematode densities in their paddocks. Chickpea ratings will be developed in collaboration with other states during the year. The current state based nematology project is ending mid-year, allowing for a comprehensive analysis of the results from previous trials. This data will aid an economic study currently being conducted into the yield loss caused by root lesion nematodes in Western Victoria.

*Joshua Fanning and Grant Hollaway*

## NEWS FROM WESTERN AUSTRALIA

### Department of Agriculture and Food, WA.

You may not have heard from us for a while and things have been changing here at DAFWA so I think firstly I should re-introduce our nematology research group. We are relatively small but are certainly busy! Carla Wilkinson and I lead DAFWA nematology research; with Helen Hunter, Lucy DeBrincat and Sean Kelly providing expert technical support. We conduct research across both broadacre and horticultural farming systems, respond to quarantine issues and grower queries, and also provide advice to our *AGWEST Plant Laboratories* diagnostics team. Jean Galloway and Rachel Lancaster watch over us as our program managers, providing support, direction and a bit of nudging when necessary.



**Figure 1.** DAFWA nematology research group. (L to R) Lucy DeBrincat, Helen Hunter, Carla Wilkinson, Sean Kelly and Sarah Collins.

As you are all aware, basic research techniques continue to evolve over time but we tend to keep most of our results ‘in house’ when they are not incorporated into formal publications. At DAFWA, we conduct a number of experiments annually to develop and maintain ‘best practice’ techniques across the different facets of our research and diagnostic responsibilities. For example, many of our broadacre cropping field trials in Western Australia, funded jointly by DAFWA and GRDC, utilise SARDI PreDicta-B to assess the resistance and tolerance of cereals to root lesion nematode (RLN) species *Pratylenchus neglectus* and *P. quasitereoides* (formerly called *P. teres*). To produce consistent results, we conduct ongoing experiments in collaboration with SARDI to ensure that PreDicta-B DNA probes are reliably calibrated for WA. Part of the calibration process is comparison of the amount of target RLN species populations from split soil samples assessed at DAFWA using morphological assessment and manual counts; and at SARDI with PreDicta-B.

Aspects of the SARDI-DAFWA RLN calibration experiments, which have been on-going for over a decade, have required re-evaluation with the aim to improve consistency of results for estimating RLN populations. We'd like to share some of our methodology results with you, as they may offer some ideas for tweaks to experimental techniques in similar research. We'll start with two experiments related to soil sampling in the paddock and soil sub-sampling for nematode extraction.

### **Experiment 1. Assessment of sampling accuracy in predicting RLN populations**

RLN populations are inherently variable spatially. To better understand the potential impact of this variability on SARDI-DAFWA RLN calibration results we conducted an experiment which aimed to determine a) an estimate of variability in nematode measurement within a plot; and b) the most accurate practicable soil sampling method (comparison of SARDI Accucore vs. CSBP pogo).

A single plot of the same size used for our broadacre nematology field experiments (1.5m x 10m) was utilised at our root lesion nematode research trial site in Toodyay. The methods for collection of soil utilised either a) CSBP pogo (100mm depth x 19mm diameter) which collects samples of approximately 28mL; or b) SARDI Accucore pogo (97mm depth x 10mm diameter) which collects samples of approximately 8mL. Fifteen replicated 500g soil samples were collected from the single plot using each of the sampling methods below, providing forty five samples in total for the experiment. All samples were assessed at SARDI with *Pratylenchus quasitereoides* PreDicta-B probe. Methods for sample collection were as follows:

1. 10 soil samples across plot CSBP pogo (440g per bag)
2. 40 soil samples across plot with CSBP pogo, gently mixed and sub-sampled (500g per bag)
3. 40 samples across plot with SARDI Accucore pogo (480 g per bag)

Results show a high degree of variability (variance of 158.9-313.5) in the number of *P. quasitereoides*/g soil recorded by PreDicta-B from repeated sampling of the same 15m<sup>2</sup> plot, regardless of the sampling method employed (Table 1). It is not possible in this experiment to determine if the high variability in results is attributed to calibration of the *P. quasitereoides* PreDicta-B probe or the inherent spatial variability of nematodes. Sampling the plot a large number of times (40) with the larger CSBP pogo, then sub-sampling to achieve the 500g sample weight gave the most inconsistent results, with *P. quasitereoides* numbers ranging from 48 to 118.5 nematodes/g soil from 15 replicate samples in the same 15m<sup>2</sup> plot. This suggests that maximising the amount of soil collected in the plot does not equate to obtaining the most representative result.

Sampling with the SARDI recommended Accucore pogo had the lowest variance of the three methods assessed but it was not statistically different from using the CSBP pogo without sub-sampling. Soil sample collection is easier and quicker with the CSBP pogo (without sub-sampling) compared to the SARDI Accucore so DAFWA nematology has maintained utilisation of this method for soil sample collection in the field.

**Table 1:** Statistical analysis of PreDicta-B *Pratylenchus quasitereoides* population estimates from repeated samples of a 15m<sup>2</sup> plot (15 replicates) using three sampling techniques

Method	Mean number of <i>P. quasitereoides</i> /g soil	Lowest number of <i>P. quasitereoides</i> /g soil	Highest number of <i>P. quasitereoides</i> /g soil	Variance	Median	s.d.
CSBP Pogo (10 samples)	63.01 a	38.8	89.4	176.6	64.6	13.3
CSBP Pogo (40 samples subsampled)	80.15 b	48.0	118.5	313.5	80.8	17.7
SARDI Accucore Pogo (40 samples)	72.79 ab	56.8	97.3	158.9	67.8	12.6

Fpr 0.01

LSD  
(p=0.05) 10.8

## Experiment 2. Soil subsampling techniques

The aim of this experiment was to determine if the method used to subsample collected soil affects the number of nematodes extracted from that soil. The impact of soil moisture on extraction efficiency was also assessed. Two soil samples from different Western Australian growing areas were sub sampled using two methods; (a) gently mixing the soil in the collection bag to homogenise the sample before taking a 200g sample; or (b) spreading the soil sample in a tray and taking 16-20 random samples of approximately 10g with a teaspoon (200g total). One soil sample was dry when it was taken from the field and one was moist. There were 12 reps of each treatment which were extracted for 4 days on a mister and nematodes counted visually at DAFWA.

There was significantly more RLN and ‘all other nematodes’ extracted from wet soil when subsamples were taken from scattered areas within the soil sample rather than mixing the soil in the collection bag prior to sub-sampling (Table 2). There were also more nematodes extracted from the dry soil when numerous subsamples were taken with the spoon but this difference was not statistically significant.

**Table 2.** Comparison of RLN and other nematodes from a wet and dry soil sample, taken from different paddocks, which were subsampled by (a) mixing the entire sample and sub sampling 200g of soil or (b) taking a total of 200g of soil from different points within non mixed soil with a spoon (16-20 sub samples).

	Soil moisture	Nematodes/g soil		F pr. <sup>2</sup>
		Mixed	Spoon	
RLN <sup>1</sup>	Dry Soil	0.47	0.89	0.1
	Wet Soil	3.49	10.88	<.001
All other nematodes	Dry Soil	35.69	38.61	0.5
	Wet Soil	35.56	57.15	<.001

<sup>1</sup>data were square root transformed for statistical analysis

<sup>2</sup>Fpr. For mixed vs spoon methods of subsampling

The action of mixing the soil in the collection bag before sub-sampling for extraction from 200g may damage the nematodes and reduce recovery of live nematodes from DAFWA's mister extraction method. Based on these results DAFWA Nematology will continue to subsample by taking 200g of soil from scattered areas within a bulk soil sample rather than homogenizing the sample by gently agitating it.

*Sarah Collins*

## **Murdoch University**

The group at Murdoch University studying plant nematology is part of the Plant Biotechnology Research Group and is based in the WA State Agricultural Biotechnology Centre (SABC). The plant nematology and aphid group consists of the following researchers and collaborators:

Prof Mike Jones

Dr John Fosu-Nyarko

A/Prof Derek Goto (Distinguished Collaborator: Hokkaido University; now moved to be a Research Director at KWS, St Louis, USA)

Dr Uma Rao (Indian Agricultural Research Institute), new Australia-India Strategic Research Fund Project awarded (2015-2017).

PhD students:

Sadia Iqbal – PhD submitted 'Effect of Knockdown of Genes Involved in the RNAi and miRNA Pathways on Root-knot Nematodes'

Jo-Anne Tan – PhD writing completed 'Characterising the 'parasitome' and establishing a protocol to use root lesion nematodes as a model for RNA interference studies in plant parasitic nematodes'

Harshini Herath – PhD thesis writing

Vineeta Bilgi\* - PhD thesis writing

Malathy Rathinasamy – Maternity leave

Fareeha Naz

Silvee Rahman\*

Sameer Khot

Farhana Begum (with Shashi Sharma)

Anuradha Sooda\*

Jebin Akhbar

(\* working on aphid-plant responses)

The focus of the nematode work is on the molecular basis of nematode-plant interactions and use of new approaches for nematode control. One focus is on root lesion nematodes and another is on application of biotechnology to pest control, as described in the following recent publications:

Jones, MGK and Fosu-Nyarko, J (2014). Molecular biology of root lesion nematodes (*Pratylenchus* spp.) and their interaction with host plants. *Ann Appl Biol* **164**, 163–181.

Fosu-Nyarko, J and Jones, MGK (2015). Chapter 14: Application of biotechnology for nematode control in crop plants. In ‘Advances in Botanical Research: Plant nematode interactions’, Edited by Carolina Escobar and Carmen Fenoll, Elsevier, pp 340-376.

Kumar, M, Roychowdhury, T, Prasad NG, Thakur, P, Papolu, P, Das, S, Tyagi, N, Kamaraju, D, Sharma, A, Banakar, P, Bishnoi, SP, Bhattacharya, A, Jones, MGK and Rao, U. (2014). The First Illumina-based de novo transcriptome sequencing and analysis of the cereal cyst nematode, *Heterodera avenae*. *PLoS ONE* 01/2014; 9(5):e96311.

National and International activities:

MJ organised sessions at:

- 6th International Congress of Nematology, South Africa, May 2014,
- 13th International Association of Plant Biotechnology Congress, Melbourne, Sept 2014
- Ausbiotech: organised meeting on ‘Food, Agriculture, Water, Energy Nexus’ (Perth, August 2014)
- 2nd Plant Genomics Asia Conference on ‘Food Security in Asia’ (KL, March 2015)
- Ausbiotech: organised meeting on ‘50 Shades of GM: Harmonisation of policy and practice in agricultural biotechnology’, Perth – 26 March 2015

Presented invited talks at:

- 2nd Plant Genomics Asia Conference, Keynote talk ‘The potential for pest control in crop plants using gene silencing’ (KL March 2015).
- Ausbiotech: 50 shades of GM – the blurring between what is or is not regarded as GM (Perth, March 2015)
- WA Farmers Federation; pro-GM Farming Group at Williams WA

*Mike Jones and colleagues*

# Information for Overseas Students

## INFORMATION FOR PROSPECTIVE OVERSEAS STUDENTS OF NEMATOLOGY WISHING TO STUDY IN AUSTRALIA

Many students wish to leave their own country to study in countries like the USA and Australia. However, there are big differences in the sorts of post-graduate studies that these two nations offer. The system in Australia is based on funding from centralised sources, but in the USA there is no Federal scholarship system. The USA takes about 10 times more post-graduate students than Australia. In the USA, a post-graduate student is usually employed on an assistantship as a part time technician with an academic and funded out of research grants and less commonly local endowments. For this reason the number of assistantships is only limited by the grant money an academic has. Potential students for this system normally contact departments with a general application and a CV. As the system is not centralised, the more places you apply to, the more chance you have, and foreign students have the same chance of getting an assistantship as local students.

Academics in Australia receive many general requests for PhD positions; presumably in the same form that they use for applying to American universities. Answering these can become a burden for academics, and many will not even reply to such general requests. In general academics are very sympathetic to the hopes and plight of students nowadays, but there is just so much that any one academic can realistically do. If you are a prospective candidate, and are serious about wanting to study Nematology in Australia (although this also applies to other disciplines and many other countries), you need to do some homework first. Without this, your application may just be ignored.

The following is a general guide to be consulted as a starting point. It is not a definitive guide to the rules, regulations and funding sources for postgraduate study in Australia, which are changing all the time and can be quite specific for different countries of origin. Remember that the situation in Australia differs in many ways to that in countries such as the USA, UK or EU. We repeat - Australian academics do not have discretionary funds like academics in the USA, and do not employ postgraduate students in technical positions. Instead, most overseas students are funded through a centralised scholarship system.

There are substantial fees for non-Australian students which must be paid by either the student or a scholarship or grant. Academic merit is the prime consideration for admission to a higher degree in Australia, rather than ability to pay fees. However, once the academic criterion is met, then the fees must be found, and this is typically by a scholarship (see below).

Your first step should be to decide what area you are interested in researching in Australia. You should then search for academics who have published in similar areas. Note that just because someone has published in the general area of Plant Pathology, this will not make them a suitable supervisor for a project on a specialized subject like nematode taxonomy for example. Research projects in an area in which a university is strong and resources and facilities are concentrated have many advantages. Remember that not all research topics are suitable for a higher degree by research, and some will be too big to be completed within the time-frame for the degree. Some

topics may not be able to be supervised or resourced within a particular university, and this again makes the point that an applicant needs to do his/her homework.

To gain the attention of a potential supervisor, it is a good idea to include an outline of a project or projects that you would like to undertake with that person. The more thought going into this aspect, and quality of preparation of the text, the more likely it is to be favourably received.

Remember to include your CV, with details of your proficiency in English, and any language courses you may have undertaken, as well as your academic record. Supervisors will look for information on an applicant's practical experience, and for any publications – particularly in international refereed journals. They will also be concerned about whether or not the applicant has funding.

All postgraduate degrees in Australia require applicants to obtain university entrance. This will require an acceptable first or subsequent degree or demonstrated experience in the subject e.g., via papers published in international refereed journals. They must also pass an accepted English language test (such as IELTS), with high scores (6 to 7 in the case of IELTS, depending on the university).

Organizations like CSIRO have a defined range of subject matter and will only support projects fitting with their mission and strategy to do research with clear benefits and outcomes for Australian agriculture or the environment. Quite a wide range of research is acceptable under this banner, but it needs to be negotiated BEFORE the organization will support an application. A candidate in a laboratory-based discipline at a University may be offered a choice of topic from a number of well-defined projects, depending on the interests of the research group.

Prospective supervisors will also be concerned about whether or not the applicant has funding or a scholarship. Most scholarships require the applicant to apply from their own country. Applicants should check with the Australian Embassy or consulate within their country to ensure that they can meet Australian entry requirements before applying.

Most applicants need to obtain a scholarship which funds all costs, including university fees, research outlays and living expenses, remembering that the cost of living is high in Australia. There are several scholarship schemes supported by the Federal government, but few scholarships, so obtaining a scholarship is very competitive. Scholarship holders and (normally) full-time candidates are restricted to a maximum of 8 hours of paid work per week during normal working hours, so it is unlikely that (even if your visa allows you to do paid work) you could support yourself in this way. Many Australian universities do have scholarships for overseas students, and details of these will be found on their respective web-sites. We emphasise that these are relatively few and there are always more applicants than successful candidates.

The tenure for most international PhD scholarships is three years in Australia, with the possibility of extension for a maximum of six months. The tenure of a master by research scholarship is two years, with no possibility of extension.

In making these points we are being realistic about the hurdles that potential applicants will need to overcome to gain a PhD Scholarship in Australia. Nevertheless, high quality applicants can succeed, and may also be successful in applying for national Scholarships, such as the Australian Government Endeavour Scholarships.

Plant and soil nematology as such is no longer taught in most Australian universities, although it is included as a component in some units. There are now few academics who are able to supervise students solely in this field, although there are opportunities within the broader context of nematode-plant interactions and nematode control. Potential supervisors include:

Dr Shamsul Bhuiyan ([sbhuiyan@sugarresearch.com.au](mailto:sbhuiyan@sugarresearch.com.au)) (Sugar Research Australia, Woodford QLD) is affiliated with the University of Queensland, and is looking for two students to undertake work on resistance of sugar cane to nematodes (see notice in this newsletter).

Dr Sarah Collins ([sarah.collins@agric.wa.gov.au](mailto:sarah.collins@agric.wa.gov.au)) at the Department of Agriculture and Food, Perth, Western Australia. She is particularly interested in nematodes associated with cereals.

Dr Mike Hodda ([mike.hodda@csiro.au](mailto:mike.hodda@csiro.au)) at CSIRO, Canberra is affiliated with ANU and Charles Sturt University, allowing him to take on students interested in questions of taxonomy and/or quarantine (but note the restrictions on potential projects outlined above).

Prof. Mike Jones ([M.Jones@murdoch.edu.au](mailto:M.Jones@murdoch.edu.au)) at Murdoch University, Perth supervises students who are interested in nematode projects including molecular studies.

Prof. John Thompson ([john.thompson@usq.edu.au](mailto:john.thompson@usq.edu.au)) and Dr Kirsty Owen ([kirsty.owen@usq.edu.au](mailto:kirsty.owen@usq.edu.au)) are affiliated with University of Southern Queensland and interested in root-lesion nematodes of grain and pulse crops.

While David Wharton, University of Otago, New Zealand and Kerrie Davies, The University of Adelaide, SA, continue to do research and to publish, they are retired, and unable to supervise post-graduate students.

Good luck!

*Kerrie Davies, Mike Hodda, and Mike Jones*

# Short Course on Plant and Soil Nematodes

## SHORT COURSE

### NEMATODES IN CROPPING SYSTEMS - IDENTIFICATION AND TECHNIQUES

#### **Information for prospective participants**

This document provides information on the course currently scheduled for:

7th-11th December 2015, at the Centre for Crop Health, University of Southern Queensland,  
West Street, Toowoomba QLD 4350.

The course content and particular nematodes discussed in the various sessions will be varied to suit the expressed interests of participants. Participants are encouraged to bring specimens or material (subject to local quarantine restrictions) for study and discussion during the course.

The presenters will be:

Dr Mike Hodda, CSIRO

Dr Kerrie Davies, University of Adelaide

Dr Nuchanart Tangchitsomkid, Thai Department of Agriculture and/or Dr Sunil Singh, University of the South Pacific (to be confirmed)

The cost of the course is AUD2000 (including GST).

The course costs cover all materials (microscope slides etc), plus a manual, and morning and afternoon teas, but not breakfast, lunch or dinner, accommodation or meals. A refectory and Subway are present on campus. Some local transport MAY be available by arrangement with local participants. International participants can be met at the Toowoomba airport if desired.

#### **The workshop requires at least 8 participants to proceed.**

For further enquiries or to book a place, please email Mike Hodda or Kerrie Davies

mike.hodda@csiro.au

kerrie.davies@adelaide.edu.au

Once confirmed (August 2015), payment details will be forwarded. Payment can be by credit card or invoice, but will be required prior to the course commencement. No particular accommodation is suggested or recommended. However, accommodation may be available on campus in student residential colleges.

### **Why Nematodes?**

Nematodes are the most numerous multi-celled organisms on earth. Soil nematodes are of great importance to cropping systems: they can significantly reduce plant yields; they are biocontrol agents of invertebrate pests; and they recycle soil nutrients. Recent work suggests that they have potential as bio-indicators of soil health. They are frequently encountered in quarantine work. Specialised knowledge is required to handle and identify nematodes. This course provides the skills and information needed to confidently handle nematodes in a wide variety of situations. It includes sampling, collecting and preparing nematodes for identification, using keys and other tools for identification, as well as the background information needed to deal with nematodes.

### **Is this Course for You?**

The workshop suits researchers and professionals working in agriculture, quarantine, green keeping, and soil biology, who need to understand the principles and practice of handling soil, plant and insect nematodes. It will provide hands-on experience in sampling, extraction, specimen preparation, culturing, diagnosis, and identification. There will be opportunity for interaction with experts in the field. Participants should have a degree which includes biology, agriculture, or soil science or have appropriate work experience to undertake the workshop. Less experienced participants can be supplied with recommended reading material prior to the workshop.

### **Course Presenters**

Dr. Mike Hodda (National Research Collections Australia & Biosecurity Flagship, CSIRO, Canberra) and Dr. Kerrie Davies (School of Agriculture, Food & Wine, The University of Adelaide) will conduct the workshop, assisted by other experts from the Asia-Pacific Region (if funds are sufficient). The presenters have almost 100 years experience researching nematodes between them, have described numerous species, and have research experience in the entire field from pure science to practical applications (one holds a patent as well). They have many years teaching experience to both graduates and undergraduates, and together have studied most taxonomic groups of nematodes over much of the Asia-Pacific Region.

### **Course Content**

- Sampling and extraction
- Preparation of specimens
- Microscopic techniques
- Ecology and physiology of nematodes
- Identification of free-living, plant parasitic and entomophilic nematodes
- Culturing (if requested)
- Biosecurity & Quarantine

### **Course Delivery and Materials**

This is designed as a laboratory-based, hands-on course supported by lectures and discussion. The workshop will be held in laboratories and lecture rooms at The University of Southern Queensland. A practical manual containing outlines of topics covered, recipes for specific techniques, a key, a glossary and a bibliography of suitable references will be provided at the beginning of the course. Participants are encouraged to bring fixed material which they may wish to work on.

## **Nematodes to be Considered**

<i>Anguina</i> .....	Seed & Leaf Gall Nematodes
<i>Aphelenchoides</i> .....	Bud, Leaf & Foliar Nematodes
<i>Bursaphelenchus</i> .....	Pine Wilt Nematode
<i>Ditylenchus</i> .....	Stem & Bulb Nematodes
<i>Globodera</i> .....	Potato Cyst Nematodes
<i>Helicotylenchus</i> .....	Spiral Nematodes
<i>Hemicycliophora</i> .....	Sheath Nematodes
<i>Heterodera</i> .....	Cyst Nematodes
<i>Heterorhabditis</i> .....	Insect Biocontrol Nematodes
<i>Meloidogyne</i> .....	Root Knot Nematodes
<i>Morulaimus</i> .....	Australian Sting Nematodes
<i>Paratrichodorus</i> .....	Stubby-Root Nematode
<i>Pratylenchus</i> .....	Root Lesion Nematodes
<i>Radopholus</i> .....	Burrowing Nematodes
<i>Scutellonema</i> .....	Spiral Nematodes
<i>Steinernema</i> .....	Insect Biocontrol Nematodes
<i>Tylenchorhynchus</i> .....	Stunt Nematodes
<i>Tylenchulus</i> .....	Citrus Nematode
<i>Tylosorus</i> .....	
<i>Xiphinema</i> .....	Dagger Nematodes
Tylenchida .....	Minor Plant Parasites
Rhabditida .....	Microbial-Feeding Nematodes
Mononchida .....	Predatory Nematodes
Dorylaimida .....	Omnivorous Nematodes
Areolaimida .....	Omnivorous Nematodes

Actual list will depend on participants' interests.

**Course Fees**

The workshop fee will be \$2000 (AUD, incl GST). The fee is payable after notification that a minimum number of participants has been met. On acceptance/registration, an invoice and instructions for payment will be sent. Payment can be by credit card, Money Order, cheque (payable to "CSIRO, Nematode Identification" ABN 41687119230), or direct transfer via BPAY. The fee covers participation, the handbook and the provision of consumables such as fixatives, slides, and culture media. Tea and coffee will also be provided. Travel costs, accommodation, and meals are not included in the fee. The workshop requires 8 participants to proceed.

**Accommodation/Meals**

Food outlets are present on the Campus: arrangements for lunches will be discussed prior to the workshop. Please indicate on the form if you require details from the workshop co-ordinator. Participants should make their own accommodation arrangements. Student accommodation on campus will probably be available, in addition to nearby motels.

**For more information**

Dr Mike Hodda [mike.hodda@csiro.au](mailto:mike.hodda@csiro.au)

ph (02) 6246 4371

Dr Kerrie Davies [kerrie.davies@adelaide.edu.au](mailto:kerrie.davies@adelaide.edu.au)

ph (08) 8313 7255

**Helpful information for the organizers**

It will help the organizers adjust the course to participants' interests and experience if the following information is provided:

University or other Tertiary Education: institution, degree, subjects (please include approx. dates)

Experience in nematology

Main interests in particular aspects of plant, insect or soil nematology

Other queries, preferences or particular topics.