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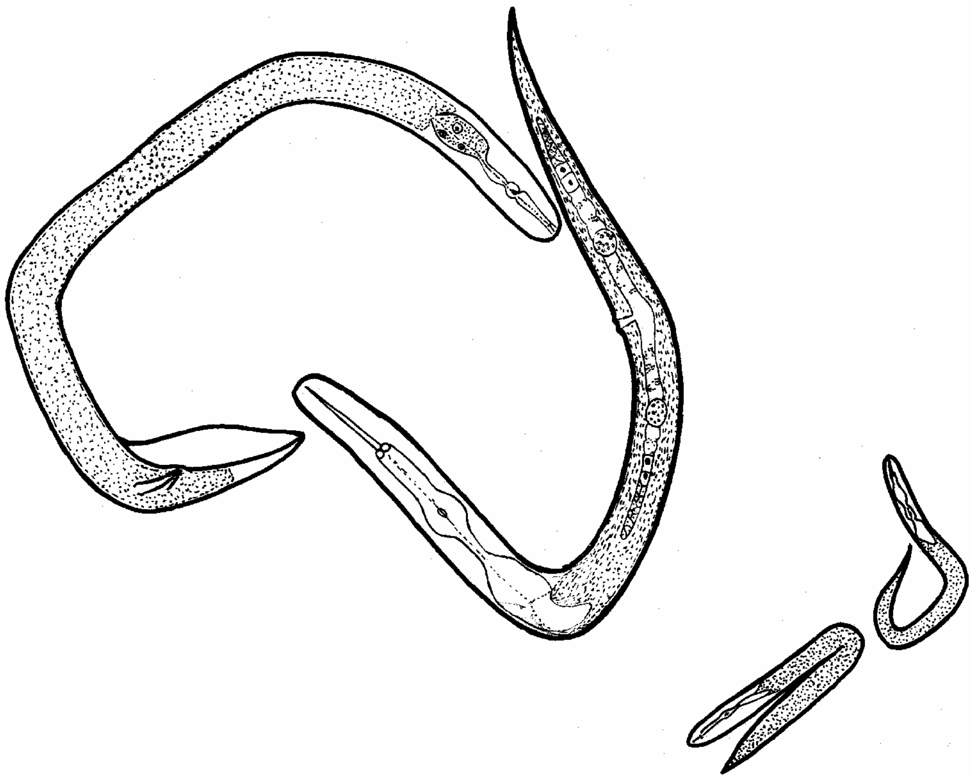
AUSTRALASIAN NEMATOLOGY NEWSLETTER



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From the Editor

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

Please note that there was only one issue of ANN in 2008, because commitments of members to the International Nematology Congress in Brisbane took priority.

July Issue

The deadline for the July issue will be early June 2009. I will notify you a month in advance so please have your material ready once again.

Kerrie Davies

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Association News

FROM THE PRESIDENT

5ICN

After all the work, the Fifth International Congress of Nematology (5ICN) has been and gone. In the end, 365 nematologists attended: less than hoped for but undoubtedly the largest concentration of such an interest group that Australia is likely to see for some time. The number of favourable comments was incredible. Perhaps the most touching for me was that from Virginia Ferris, one of the speakers at the final, who said that it was a real highlight of her career. From someone plenary who has been contributing to nematology for a long time, this was high praise indeed (one of the perks of being the front-man for the whole show was that I got many of the thanks, while those responsible for it being so good did all their work in the background).

Another highlight for me was the Australian Dollar peaking at US$0.98 on the Wednesday of the conference (I'm being facetious now). A number of people from the US commented on the apparent cost, which would have been very different with the Aussie Dollar at US$0.63 as it is now. I am glad that I am not trying to make a living with anything involving currency fluctuations. Hopefully, our farmers export contracts are written in US$.

Hopefully, the Congress has increased community awareness of nematodes, created new opportunities for collaboration with nematologists, and provided a far greater range of science than one gets at purely local meetings. At the time of writing we were still awaiting the final payments from sponsors, and had a few outstanding bills to pay (awaiting receipt of some payments). However, we managed to survive the high value of the dollar, provide a terrific venue and program and have broken even. I hope we can dissolve 5ICN Inc. once these final transactions have been completed, then AAN can receive our undivided attention.

It was great to see many AAN members at 5ICN, and have a short AAN meeting, followed by a longer informal dinner, there.

APPS

The next event on the nematological calendar will be the **biennial APPS meeting**. The next meeting is scheduled for Newcastle (NSW) from 29 September to 1 October 2009. At the last AAN meeting, the issue of the traditional nematological workshop held with APPS was discussed. As I recall the idea was to discuss beneficial and free-living nematodes.

I have sounded out some of the potential contributors to such a workshop and come back with only lukewarm responses. As we have just had 5ICN, and there will be the 5-day short course held by Kerrie Davies and myself immediately after APPS, **is there sufficient interest in a one-day workshop as well? Would anyone interested in attending, and more importantly contributing, to a nematological workshop** on the topic above (or any others if you feel strongly that the topic should be otherwise) **please contact me?** How many people plan to attend? Any other thoughts would be welcome, so please email me.

Mike Hodda

FROM THE TREASURER AND SECRETARY

Membership of the AAN currently stands at 71. At the time of publication, twelve of these members were un-financial. If you think this applies to you, please contact Vivien at the email address on page 1. Five of these twelve have lapsed in their membership for a year or less, but seven have been in arrears somewhat longer. Unfortunately, this may be the last newsletter for these seven.

Seven members have left AAN through career changes or retirement. Long-standing member Rod McLeod has retired from AAN and extends his best wishes to all.

We have gained eight new members:

- Aisuo Wang, School of Agriculture and Veterinary Science, Charles Sturt University
- Ali Farman, Department of Zoology, University of Otago, Dunedin, New Zealand
- Katherine Linsell, Plant Genomics Centre, Waite Campus, Adelaide SA
- Mulawarman, Sriwijaya University, Indonesia
- Ros Reen, DPIF Qld, Leslie Research Centre, Toowoomba Qld
- Shahidul Haque, Enza Zaden Australia Pty Ltd, Narromine NSW
- Uma Khurma, Faculty of Science and Technology, University of the South Pacific, Fiji
- Una Turaganivalu Salaiwai, Fiji

The hefty tome of abstracts from the Fifth International Congress of Nematology can be found on the web at www.ifns.org/pdf/ABSTRACTS_for_5ICN_2008.pdf.

The Australasian Plant Pathology Society committee for Western Australia (Sarah Collins, Chris Dunne, Aaron Maxwell and Daniel Huberli) is keen to receive Pathogen of The Month (POTM) contributions. Some nematodes have already starred, but there is always room for more.

See POTMs at www.australasianplantpathologysociety.org.au for an indication of the format and content. POTMs receive a good hit rate from internet searches, so the potential audience is large. If you have any nematode ideas for future POTMs, please contact Sarah Collins.

Vivien Vanstone and Sarah Collins

GENERAL MEETING

6 pm, 15 July 2008, Brisbane

DRAFT MINUTES

Attendees – 28

Convening meeting – Mike Hodda (President)

Sarah Collins (Secretary)

Vivien Vanstone (Treasurer)

1. 5ICN congress overview – Mike Hodda

- 5ICN was a success with ~ 360 delegates from 26 countries and good publicity to the wider community
- The bank balance is $6067.68 excluding monies related to 5ICN
- Who should get the funds generated by 5ICN?
    - Students (Australasian) to attend conferences/workshops?
    - MOTION – any excess funds from 5ICN congress be retained by AAN to promote the aims of the association and to assist with a loan for the next ICN congress if asked and funds are available. Unanimous 'all in favour' vote from members present.

2. Nematology workshop for APPS conference Newcastle 2009

- 1 day workshop is usual format
- What are members interested in having for subject of workshop?
    - Soil health (free-living nematodes). Other suggestions need to be made by the end of August 2008
- Who wants to organise the workshop?
    - Nominated/volunteering people – Nigel Bell, Tony Pattison, Jackie Nobbs, Gregor Yeates, Niki Seymour, Kirsty Owen, Rod McLeod, Lila Nambiar (slides), Jenny Cobon
- Workshop format?
    - Hands-on
    - Both talks and lectures
    - Photography for good referencing
    - Ratios of trophic groups

3. New members

- People from the Australasian region should be encouraged to become members so that AAN can develop a more representative membership from the whole region
- Welcome to new members – Ros Reen (Qld), Uma Khurma (Fiji), Una Turaganivalu (Fiji), Mulawarman (Indonesia), Ali Farman (NZ)

- APPS has been informed of new committee members for forwarding documentation and questions

4. Work by Graham Stirling

- Graham was warmly thanked for the hard work that he did on the Nematology issue for APP

5. The data from the international questionnaire presented at 5ICN

- Should we update the data that has been collated in the questionnaire?
    - 'YES' - the figures would be terrible for researchers in Nematology due to the funding constraints that it could cause
    - Dollar values change but we can give snapshots
- What to do?
    - A co-ordinated email to develop an agreed national figure for different crops
    - Vivien to send out a table for members to fill out and return by mid August
    - Vivien and Mike to collate information

6. Fred Jones

- Roger Jones has been collating documents on PCN from his Father's unpublished work. This work deserves to be recognised and publicised
- Relevant information for the website etc. will be placed in the next AAN Newsletter.

7. Other business

- Kerrie Davies and Mike Hodda are considering running a short course in 2009. Any interest? Contact Kerrie.

Meeting closed at 7 pm.

Regional News

NEWS FROM SOUTH AUSTRALIA

The University of Adelaide

Kerrie Davies has been on the road again, with a collecting trip to Costa Rica in March, one to Cairns in July, and 10 weeks in Florida from August. In Costa Rica she met Robin Giblin-Davis, Deb Nehmer, Tom Powers and Natsumi Kanzaki, and worked with them collecting various samples. Kerrie was concentrating on nematodes from fig sycones, but also helped dissect insects for associated entomophilic nematodes. The trip to Cairns followed 5ICN, and this year was especially nice as she was joined by Robin and Natsumi. More collections of *Fergusobia* and *Schistonchus* were made. In early August, Kerrie flew to the Fort Lauderdale campus of the University of Gainesville, to work in Robin's lab. There she was trained in techniques for extracting DNA, PCR and running gels etc., and drew, measured and described 7 new species of *Schistonchus* from Central American *Ficus*. It was a fabulous, exciting trip.

Elise Head has been awarded her MSc for her project on the ecology of *Fergusonina*/*Fergusobia* in a wetlands site in Adelaide.

Katherine Linsell has begun her PhD on 'Genetic and physiological characterisation of resistance to root lesion nematode *Pratylenchus* sp. in wheat'. The overall objectives of this project are to identify the genetic loci and closely linked markers for the *P. thornei* gene(s) in the partially resistant Sokoll/Krichauff population and to histologically describe the resistance response.

SARDI

Ian Riley (University of Adelaide/SARDI) has been in China since early July with support of a Endeavour Australia Chueng Kong Fellowship undertaking collaborative research on cereal cyst nematode (CCN, *Heterodera avenae*). He has been based in Chen Shulong's lab in the Institute of Plant Protection in Baoding, Hebei. However, the fieldwork has focused on spring wheat areas of the Tibetan Plateau in Qinghai, working with Hou Shengying. The aim was to examine spatial distribution, and the contribution of crop rotations, of CCN populations densities in cereal crops at a village scale. Farming families in these villages grow wheat (or barley), potato and broad bean for subsistence, with cash being generated by rapeseed and some animal production. Improved yield and reliability of their cereal crops would allow the farmers to reduce plantings and grow more cash crops.

The current focus on CCN in China arose from an ATSE Crawford Fund Master Class on Soil Borne Pathogens of Wheat held in Zhengzhou in 2005. During the class fields in 4 provinces were sampled for CCN to discover that the nematode was more common and at higher densities than imagined. This stimulated survey, yield loss and other studies in winter wheat in the provinces responsible for most wheat production in China (Henan, Hebei, Anhui). It became evident that CCN occurs nearly everywhere winter wheat is grown and is the cause of significant damage. However, less is known about the situation in spring wheat. Total spring wheat production is much less and tends to be subsistence production, so not so significant for the country but of vital significance for farming communities that depend on it for their daily food.

With the field and lab work completed, data analysis provided some interesting insights to CCN in spring wheat areas. On first pass, there appeared to be no relationship between the preceding crop and final population densities in wheat, barley or oats, even if the preceding crop was a host for CCN. Any rotational effects were masked by strong spatial variability and high levels of hyperparasitism. Some fields had remarkably large numbers of empty cysts, indicating a history of infestation, but no cysts with mature eggs were found. However, it was easy to find parasitised cysts and many of the empty cysts were small, presumably because young females had been parasitised. Despite this, a significant number of fields had egg densities over 10 and up to 60 eggs/g soil. So it seems that the natural biocontrol does not provide full protection. Yield loss studies are in progress and if CCN is shown to be problematic, there would be clear justification for introducing suitable resistance to adapted cultivars and to learn more about what factors promote natural biocontrol.

Ian will return to Australia in late January, charged with memorable professional and cultural experiences, but needs to find a role for the future. The MLA-funded work on pasture soil biology in SARDI has concluded, not for lack of quality progress but as a consequence of the tightening of rural research funding associated with the extended drought in much of Australia.

Plate 1. Spring wheat and other crops are grown in terraced fields in the mountain villages of Huang Zhong county, Qinghai China

Plate 2. Hou Shengying and Ian Riley meeting a local farming family after a long day's soil sampling, putting the Acucore through its paces.

Plate 3. Winnowing wheat with a large paddle and little breeze. Most harvesting is done by hand with sheaves brought to threshing floors near the village for processing.

NEWS FROM NEW ZEALAND

Department of Zoology, University of Otago

Greetings! It was good to meet many of you for the first time at 5ICN - I especially enjoyed the AAN dinner.

My lab is quite busy at the moment, so here's a summary of what we've been up to. MŽlianie Raymond is nearing the end of her PhD on 'The biology of Antarctic nematodes'; she's currently doing some phylogenetic studies. Stephen Clarke is continuing his PhD on 'Ice active proteins' from the Antarctic nematode, *Panagrolaimus davidi*. Farman Ali has just started a PhD on 'Cold tolerance in entomopathogenic nematodes'. Daniel Leduc has submitted his PhD thesis on 'The role of meiofauna in intertidal food webs', which is currently being examined. His study included nematodes and he recently published a paper describing three new species of marine nematodes in *Nematology*. In the non-nematode area: Kalinka Rexer-Huber is doing a MSc project on 'Cold tolerance of the brown tree frog, *Litoria ewingii*' and Tim Hawes is a postdoc from the UK working on 'Cold tolerance of NZ alpine and Antarctic arthropods', funded by a Leverhulme Fellowship.

I'm currently on study leave. I've been writing papers and just had one published in the *Journal of Experimental Biology*. Here's a description from the *Otago Bulletin*:

"Good oil saves dehydrating worm

Otago research recently made the front cover of the Journal of Experimental Biology with the description of a previously unknown mechanism by which a nematode worm controls its rate of water loss when suddenly exposed to extremely dry conditions. In collaboration with colleagues from Chemistry and Human Nutrition, Associate Professor David Wharton of Zoology showed that the plant-dwelling nematode *Ditylenchus dipsaci* produces an oily material that slows water loss. Through this mechanism, which has never been seen in any other organism, the worm is able to successfully enter a suspended state known as anhydrobiosis in which it is almost completely desiccated."

Thanks to Sharyn Taylor (ex of SARDI) for supplying me with the worms that I used to establish cultures for that study.

I'm also working on some new techniques for studying osmoregulation in nematodes and for detecting ice-active proteins in organisms. Off to the UK for six weeks (holiday!).

David Wharton

Research

POTATO CYST NEMATODE FOUND IN GIPPSLAND

Dagmar Hanold
ProMed-mail Archive no. 20081021.3334, www.promedmail.org

A 20 km quarantine zone in Thorpdale's potato region has been declared following the discovery of potato cyst nematode (PCN).The discovery, made during routine crop surveys required to meet standards for seed potato certification, could have a devastating effect on the industry. Department of Primary Industries (DPI) scientists identified PCN in soil samples taken from the affected property this week. Additional samples have been sent to an interstate laboratory for further confirmation.

DPI Principal Plant Standards Policy Officer David Beardsell said that DPI was meeting with potato industry authorities and growers today [17 Oct 008]. "A team has been set up by DPI to manage the response to the detection which is likely to include an intensive soil surveillance program, to establish the PCN status of other properties in the district," he said. "This will be in addition to the ongoing soil testing required by certified seed growers."

Dr Beardsell said trade restrictions would apply to areas where PCN was detected including a 20 km exclusion zone. No plant material or equipment from the zone can be moved interstate. "Unfortunately this detection has serious implications," he said. "It will affect marketaccess for both seed and fresh potatoes grown in the area around the detection site."

The discovery comes just 6 months after a plant protection zone was declared in Gippsland and after 16 years of testing found no evidence of PCN. Mr Beardsell said Thorpdale supplied up to 30 per cent of Australia's certified seed potatoes, so there could also be repercussions for seed supply around the country next season. "Joint efforts by DPI and industry to effectively manage this case of PCN will minimise both the risk of spreading this disease further and the trade implications," he said.

Dr Beardsell said the industry and DPI had effectively managed previous cases of PCN in the Gippsland area. He said it was not known how the disease entered the property. "PCN can be transferred on machinery or product but we also know it can remain dormant in soil for up to 20 years," he said.

PCN IN AUSTRALIA: MYTHS FROM THE PAST AND NARRATIVES FOR THE FUTURE

Mike Hodda
Nematode Biosystematics and Ecology, CSIRO Entomology, Canberra

(The following is the text from an article I was asked to write for Potatoes Australia concerning how to manage PCN in Australia. It is intended to be very general because of the audience for that publication, and I was specifically asked to be forthright. With that in mind, it was suggested that it would also be of interest to AAN members who may not read Potatoes Australia, so it is reprinted below, with minor alterations).

"Know your enemy" might be a good motto to use when deciding what to do about Potato Cyst Nematode (PCN) in Australia. There are a lot of myths and misconceptions about these little beasts, so here is an attempt to dispel some of them, from someone who has worked on nematodes for nearly 30 years.

First myth, PCN is not really an enemy. To date the damage in Australia has been small.

This is an easy myth to dispel. Every nematode which has an English common name is a pest. You need not worry about *Acrobeloides nanus*, which is a common nematode in most Australian soils and eats microbes, but you had better watch out for Root-Knot or Stubby-Root or Cyst Nematodes.

Everywhere in the world it has become established, PCN either causes major crop losses or costs time and money to make sure it does not cause major losses. PCN rated the seventh most costly pest in a recent survey of the biggest nematode problems throughout the world presented at the International Congress of Nematology in Brisbane. This is despite the fact that it occurs in relatively few places.

This brings us to **myth number two**: PCN is everywhere. In the last survey by EPPO, PCN was widespread in 28 countries, and occurred in restricted areas of another 40, but was absent from 130 countries. Of the top 30 countries to which Australia exported potatoes in the last 10 years, PCN was absent from 22, restricted in 4 and widespread in only 4. PCN is not everywhere.

Myth number three: we should not be concerned. This is flying in the face of world opinion. Everyone else is concerned and spends money to prove it. Currently, 106 countries in the world regulate movement of produce because of the risk of PCN. This is double the number of countries that did so 20 years ago.

Even countries where PCN is widespread regulate to minimise further spread. In Europe, new regulations have just been implemented which INCREASE the range of crops tested and the control over spread of PCN.

And it is not just potatoes that are quarantined. Anything that comes from soil which MIGHT have PCN is quarantined: ornamentals, root crops and machinery to name a few. Many countries treat pest threats on a national basis unless evidence is presented otherwise. So, if PCN is present in one state, then anything from the entire country is regarded as potentially infected unless it can be demonstrated that there are effective measures in place to prevent any spread from that state to the rest of the country.

People say—rightly—that major crop losses are now rare in much of the rest of the world. Crop losses may now be rarer than they were, but an awful lot is spent on testing, resistant varieties, and nematicides. Farmers would not spend substantial amounts of money (estimated at about 100 million dollars in England) on these things were it not necessary to protect their investment in the crop. They know that if they didn't spend the money up front it would cost more later.

Economic modelling by the CRC for National Plant Biosecurity shows that the cost of PCN to Australia will be a minimum of $140 million over the next 30 years if it becomes established. The biggest costs are in the future. I will return to this shortly.

This brings us to what I consider **the biggest myth**. This is that nothing can be done because PCN is probably everywhere in Australia already (the horse has bolted and all we can do now is to manage the problem).

At the time of writing we did not know the distribution of PCN in Australia. It is important that we find out with pretty high certainty where it is, and what follows will depend on the results of such a survey.

But we do know what has happened when pest nematodes have invaded elsewhere. This is that it is often up to 30 years after the introduction of a nematode that it actually becomes a pest. This seems to apply to many different pathogenic nematodes, not just PCN.

In the case of PCN, it is not surprising that adaptation may take some time. PCN originally comes, like the potato itself, from the high Andes in South America, where the soils, climate and a lot of other factors are different from Victoria. These differences are one reason why different varieties of potatoes have been developed and are now grown. Just like the potato, the nematodes have to find the right "variety" (generally termed "pathotype" or "regional variant") to best handle the new conditions. In other invasions, the time for the nematode to adapt to the local conditions and become a real problem has been about 30 years or more.

PCN was found in Victoria 17 years ago, so we are in the 30 year period now, but the clock is ticking…

In this respect, Australia is the "Lucky Country" once again. We are still in the window of opportunity when the nematode is still down. If we can bust the myths we can do something effective. That is good news.

What can we do?

Nothing is an option, but all the indications are that it will cost everyone, not just Victoria, and not just the potato industry, a lot. Economic modelling from the CRC for National Plant Biosecurity suggests that this will be about six million dollars a year. A lot of this cost will be borne outside the area we currently know to have PCN. This does not look like a good option to me.

Management to prevent spread of PCN and minimise impacts where it occurs is another option. This is the strategy in most of the EU, but will cost a lot, too. A lot of testing is required, and this is expensive, with the costs of this plus regulation and preventing severe economic damage running somewhere near the costs of the first option. Again, pretty expensive.

The best option, I suggest, is eradication. Most or all of the places where PCN has been discovered recently have opted for it, most notably the USA, Canada, and Western Australia. It may cost up-front, but ultimately it is cheaper.

This is where **another myth** needs busting. This is that it is just a local problem, and just a potato problem. As far as quarantine is concerned it is a national problem, and there are other crops and exports affected, so it is, to some extent, everyone's problem. It is legitimate, indeed justified, that those most affected should be assisted by those who will be affected later if the problem is not addressed. This sort of compensation is happening in the outbreak in Idaho.

Eradication of PCN has worked in Israel, in parts of the USA (Delaware), and it looks like it has worked in Western Australia. The benefits of these eradications have yet to be calculated. However, the recent eradication of another exotic pest nematode near Melbourne had a benefit to cost ratio of about ten thousand per cent (this one had the benefit of very early detection and swift action, which made it so beneficial). The message from this and other nematode eradications is that the benefits can be great, but the longer it is left, the more costly eradication becomes.

What would be involved in eradication? First, we need to know exactly where PCN is nationally. This is being done as I write as part of the emergency response to the recent finds in Victoria. So the first step is already underway.

Second, we need to know PCN biology under local conditions. This is an important pre-requisite to effective eradication. This must be done on our populations and under our conditions. We cannot just rely blindly on research conducted for different purposes under foreign conditions. We have the capacity to do this.

Third, we need to know about dispersal to make sure that PCN does not spread while it is being eradicated. We need scientifically-based regulations in place to make sure this happens effectively.

Once the first three steps have been taken, then comes the most important part, which is to use this knowledge to hit PCN with every weapon we have. There are chemicals to directly kill nematodes (including new ones that are cheaper and possibly more effective). We have trap crops to induce PCN out of the protective cyst but not let it reproduce. There is weed control to ensure there are no hosts. We have biofumigant crops to further reduce soil populations. There is seed certification and there are resistant cultivars, although these have to be used carefully. All of this has to be backed up by regulation and commitment to achieve the outcome.

Using all these methods the US is aiming to eradicate PCN in Idaho in seven years.

Armed with the right knowledge, not myths, I believe the story can have a happy ending here too, for everyone except the nematodes.

THE GOLDEN CYST NEMATODE (*GLOBODERA ROSTOCHIENSIS*) ON POTATO IN INDONESIA

Mulawarman
Plant Protection Department, Agriculture Faculty University of Sriwijaya, South Sumatera Indonesia. Jl. Simpang Indralaya, KM 32 South Sumatra, Indonesia.

Golden cyst nematode (*Globodera rostochiensis*) is the main plant parasitic nematode on potato. For many years it was not seen as a problem on potato crops in Indonesia and was put under/listed by quarantine authorities of Indonesia as class A1 (has not been found in Indonesia). In March 2003, in Sumber Brantas, Kota Batu, East Java the nematode was identified and estimated to have infested 200 hectares from the total 800 hectares of the cultivated potato variety Granicola. In the same time, sampling was carried out in Batur, Pejawaran, and Wanayasa East Java and especially in Batur. The number of nematodes reached 37.28 cysts per 200 ml^{-1} soil and 10.76 cysts per plant.

The last survey showed the nematode has already spread to Middle Java, West Java and North Sumatra. The crop loss was estimated around 31%-71% at the potato centre in Tulung Rejo, East Java. The nematode was presumed to enter the potato center through potato seedlings imported since 1986.

The management control was developed based on keeping the population under the economic threshold. The strategy follows integrated pest management focusing on development of potential bioagents to control the nematode and organic amendment using formulated chitin. Some potential bioagents are *Fusarium oxysporum* TR1, *F. solani* TR2, *F. chlamydosporum* SM4 and *Paecilomyces lilacinus* SM3.

PASTURE NEMATODES

Ian T. Riley, Jackie M. Nobbs and Alan C. McKay
SARDI Plant and Soil Health, Plant Research Centre, Urrbrae SA 5064

Pasture nematodes were an important component of the recently completed project, “Molecular Tools to Study Soil Biological Constraints to Pasture Productivity”, a component of the MLA, AWI, GWRDC Pasture Soil Biology Initiative. The project developed and evaluated range of RT-PRC assays of DNA extracted from soil to facilitate study of pathogens, beneficials and plant roots directly in pasture soil. The nematode targets in included *Ditylenchus dipsaci*, *Heterodera avenae, H. trifolii*, *Meloidogyne fallax*, *M. hapla*, *M. javanica/incognita/arenaria* (combined) and *Pratylenchus neglectus*, *P. penetrans*, P. *thornei*, being the complement of existing (developed for cropping soils) and new assays (either developed by this or allied projects).

When applied to soils collected from pastures across southern mainland Australia and to samples from several intensively studied sites in ACT, NSW and WA, the unexpected finding was that detectable populations of these plant parasitic nematodes were relatively uncommon. Also, when detected, population density estimates were not indicative of significant nematode constraints to pasture production. This finding was not entirely inconsistent with work of Stirling and Lodge (2005, Aust. J. Soil Res. 43, 887-904), who extracted, counted and identified (to genus) vermiform nematodes from pastures in the northern tablelands of NSW and the southeast of SA. However, the incidence and densities found by the DNA work, which collected more widely, tended to be lower. A possible explanation was that the nematode targets for the DNA assays were too narrow and that other species might be more common in pastures.

To test this hypothesis, a collection of soil from 16 high-rainfall pastures in the southeast of SA was undertaken to specifically assay and identify *Pratylenchus* species, as this genus was the most common in early samples assayed by the project and in those of Stirling and Lodge (*ibid*.). By extraction of vermiform nematodes, *Pratylenchus* spp. were found in 10 of the 16 samples, with half of these being at moderately high densities. However, by DNA assay, *P. thornei* and *P. neglectus* were detected in only 1 and 2 sites, respectively. Microscopic examination of extracted *Pratylenchus* from the other sites found morphotypes with affinities to *P. penetrans* and *P. crenatus* (also one population was found to contain *Radopholus* as well).

So, *Pratylenchus* is common in high rainfall pastures of SA, and it appears to have greater species diversity than previously recognised. Clearly there is a need to better understand the diversity and impact of *Pratylenchus* in high rainfall pastures and if appropriate, to develop DNA assays for the important species to facilitate their study.

THE COSTS OF NEMATODES TO AGRICULTURE

INTRODUCTION

Mike Hodda
Nematode Biosystematics and Ecology, CSIRO Entomology, Canberra

Readers who were present at the 5ICN plenary session on *Commonalities and differences in nematode issues across the globe* were treated to a very interesting paper entitled *Similarities and differences in nematode problems and management strategies as revealed by a world-wide questionnaire*. The paper reported the results of a survey of an email questionnaire of all members of nematological societies across the globe, taken from January to April 2008. The survey consisted of 28 questions in 3 sections: nematode problems and crops, economic and yield losses, and management of research.

This presentation, the abstract of which is presented below, caused considerable debate. This is no bad thing, and has focussed attention on a number of issues surrounding the costs of nematodes to agriculture. Responses from several people to some of the issues raised are included in this newsletter. Other comments are welcome.

SIMILARITIES AND DIFFERENCES IN NEMATODE PROBLEMS AND MANAGEMENT STRATEGIES AS REVEALED BY A WORLD-WIDE QUESTIONNAIRE

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The last two decades' research on plant-parasitic nematodes has been confronted with interesting challenges. Molecular techniques have been developed and introduced, environmental and food safety concerns have raised questions as to the ubiquitous use of nematicides, and biological control has become more important. New threats have arisen from global trade and climate change. Results from a world-wide questionnaire has provided up-to date information on the impact of plant-parasitic nematodes, the control measures currently used to control them and the status of research on plant-parasitic nematodes. In total, 285 nematologists and plant pathologists from 52 countries contributed. Most responses came from Europe (24.6%) followed by Asia (21.9%), North America (21.1%), Africa (17.5%), South America (10.5%) and Oceania (4.4%).

Meloidogyne incognita, *M. javanica* and *Ditylenchus dipsaci* were found to be most prevalent. In Asia *Pratylenchus neglectus* was most reported, in Africa *Radopholus similis* and in Europe *Globodera rostochiensis*. On a global scale, chemical treatments are still the most widely used control strategy. However, in Europe the use of nematicides is significantly less compared with that in other continents due to the strict regulations and a total ban on the use of several compounds. Although most participating countries have a diagnostic service available, preventative soil sampling is not commonly used to avoid nematode problems. It is linked to improved awareness of plant-parasitic nematodes by growers and farmers. Molecular tools are widely used in developed countries in research but not yet for diagnostic services. In developing countries identification of nematodes is often limited to the species level, and molecular identification is absent. The use of biological control agents is still very limited throughout the world, most likely due to the absence of reliable results with the few

commercial products available. The use of resistance is mainly focused on potato and soybean cyst nematodes and root-knot nematodes. This leaves many challenges for nematology where also genetic modification should be considered.

Based on the collected data on economic losses an estimate of the global impact of plant-parasitic nematodes will be made.

THE IMPACT OF PLANT-PARASITIC NEMATODES: AUSTRALASIA

Compiled by Vivien Vanstone
Department of Agriculture and Food Western Australia

This information was supplied by members of AAN in response to a "global survey" conducted by Wesemael *et al*. (Proceedings, Fifth International Congress of Nematology, Brisbane, Australia, July 2008, p.54). Figures have been estimated to the best ability using currently available data and experience.

Contributors/References

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- Pattison and Cobon (Queensland) pers. comm.

Notes

- Omission of a crop/nematode does not indicate that there is no effect, rather that the data are not available.
- Values do not include the cost to growers of nematode management and/or control.
- Stirling, Stanton and Marshall 1992 *Australasian Plant Pathology* 21, 104-115 estimated that losses from nematodes were >$300 M p.a.

Table 1. Estimates of crop losses due to nematodes in Australia.

Species	**Crop**	**Region**	**Yield loss (%)**	**Economic loss p.a. (A$)**	**Extent of infection (ha)**
Pratylenchus	Wheat	Western Australia	10-30	150 M	5.3M
Heterodera avenae	Wheat, barley oat	Western Australia	30	50 M	390,000

Meloidogyne Pratylenchus Xiphinema Tylenchulus Criconemella Paratylenchus Paratrichodorus Tylenchorhynchus	Grapevine	Western Australia	Has not been adequately quantifies		4,000
Meloidogyne Pratylenchus Heterodera schachtii Trichodrus Paratylenchus Paratrichodorus Tylenchus Criconemoides Helicotylenchus Tylenchorhynchus	Various horticulture	Western Australia	Chemically controlled, otherwise losses would be great		7,500
Radopholus nativus R. vangundyi	Wheat, canola, barley	Western Australia	5-10	2.4 M	80,000
Pratylenchus	Wheat	South Australia, Victoria	10-30	40 M	4.2 M
Pratylenchus	Wheat	Queensland, New South Wales	8	69 M	2.8 M
Criconemoides Helicotylenchus Hemicycliophora Meloidogyne Paratrichodorus Xiphinema	Turf, grasses	Various	Has not been adequately quantified		
Meloidogyne Pratylenchus Ditylenchus dipsaci H. schachtii	Horticultural crops	Victoria	5-10	20 M	80,000
Meloidogyne	Grapevine	Victoria	5-10	5.6 M	20,000
Meloidogyne Pratylenchus	Fruits	Victoria	3-5	5 M	2,000
Mixed *Meloidogyne Heterodera Pratylenchus*	White clover	New Zealand	40% (plant yield)	32 M	7.5 M
Mixed *Meloidogyne Heterodera*	White clover	New Zealand	55% (lost nitrogen fixation)	39 M	7.5 M

Pratylenchus					
H. avenae	Wheat, barley, oat, triticale	South Australia	5	5 M (100 M without use of cultural control and resistant/ tolerant cultivars)	3.0 M
H. avenae	Wheat, barley, oat, triticale	Victoria	5	5 M (50 M without use of cultural control and resistant/tolerant cultivars)	2.1 M
D. dipsaci	Oat (grain, feed, hay); field pea; canola, lentil, chickpea (seedling emergence and establishment)	South Australia	? Extent of loss seasonally/regionally dependent; can be 100% depending on season/crop	? Market access issue for Australian produce to some countries	
Mixed *Pratylenchus zeae M. javanica*	Sugarcane (plant)	Queensland	10	82 M	
Tylenchorhynchus annulatus Helicotylenchus dihystera Paratrichodorus minor	Sugarcane (ratoon crop)	Queensland	7		
Radopholus similis	Banana	Queensland	5-20	10 M	10,000
Pratylenchus goodeyi	Banana	Queensland, New South Wales	5-20	2 M	3,000
Meloidogyne	Vegetables	Queensland	5-100	75 M	
Meloidogyne	Strawberry	Queensland	5	7 M	
Meloidogyne	Pineapple	Queensland	10	5 M	
Meloidogyne	Grapevine	Queensland	10	4 M	
Meloidogyne	Culinary herbs	Queensland	10-50%	5 M	
Total				**626 M**	

ESTIMATES OF CROP LOSSES DUE TO NEMATODES - COMMENT

Graham Stirling
Biological Crop Protection, Mogill

In this newsletter, Vivien Vanstone has compiled a table of estimated losses from nematodes that updates a paper I co-authored 16 years ago (Stirling *et al*. 1992, APP 21, 104-115). Such information is often used to support applications for research grants and to justify our existence, but is it believable? I have a number of concerns about such estimates.

- Nematicide trials often over-estimate losses
  - Nematicides (particularly fumigants) do more than control nematodes. They also increase yields by changing te soil's nutritional status and by affecting organisms such as fungi and other invertebrates.
  - Nematologists tend to establish trials in areas where nematode populations are high. It is therefore difficult to extrapolate to areas with more typical nematode population densities.
  - Good information on nematode distribution improves any crop loss estimate, but how often do we have good survey data?
- Estimates usually do not reflect the role of soil type. In my experience with root-knot nematode, for example, damage is highly dependent on soil texture. Crop losses decline markedly as the clay content increases, with a few per cent increase (say from 6-10%) making a big difference.
- Environmental factors have a major impact on crop losses. In experiments with root-knot nematode on tomato in Bundaberg, for example, losses of 16-36% were observed in crops that matured in summer. However, there were no yield losses in winter, despite the fact that roots were severely galled (Vawdrey and Stirling 1996, APP 25, 240-246).
- Farming is an unforgiving occupation, and those farmers who survive in today's competitive environment have developed farming systems that don't suffer major losses from nematodes. For example, root-knot nematode has little or no impact on tomato yield in Bundaberg, presumably because growers have learnt to achieve a fallow and/or solarisation effect by preparing their beds and laying plastic 2-3 months before planting (Stirling and Ashley 2003, APP 32, 219-222).
- We don't update estimates as farming systems change. My work in sugarcane provides an example. On the basis of the results from nematicide trials, losses from nematodes were estimated at $82 M/year (Blair and Stirling 2007, AJEA 47, 620-634). However, these trials were done in the mid 1990's, when there was little crop rotation and major soil compaction problems. We now have a farming system where soil health is much better (due to legume rotation crops, residue retention, reduced tillage and controlled traffic). Losses from nematodes will have been reduced but by how much? Without repeating our experiments, all we can do is guess.
- If estimated losses from nematodes, plant diseases, insects and weeds were added together, we would lose more than half our crops to pests and pathogens. However, despite the dire predictions of specialists, we continue to produce record yields in most crops.
- The costs of control measures for nematodes may be more important than crop losses in some farming systems, but few attempts are made to quantify them.

In summary, the numbers in the table are useful, but they need to be used with an understanding of the many factors that influence crop losses from nematodes.

THE REAL IMPACT OF NEMATODES ON AGRICULTURE: SOME THOUGHTS ABOUT WHAT WE KNOW AND DON'T KNOW ABOUT NEMATODE COSTS AND BENEFITS

Mike Hodda
CSIRO Entomology, GPO Box 1700 Canberra ACT 2601

The paper by Wesemael *et al*. (2008) presented a figure of US$1.8 billion per annum as the direct total cost of nematodes to world agriculture. I, like many people I spoke to following that presentation, were concerned that this figure vastly underestimated the effects nematodes have on crops. The figure was much smaller than the 100 billion estimated in 1987 (Sasser and Freckman 1987), and only slightly larger than the estimated effect of one genus of nematodes (*Pratylenchus*, RLN) in one country (Australia), which is A$200 million per annum (at the time the Australian and US currencies were almost on par in value).

Any survey is potentially biased by the number, identities and interests of the respondents versus the non-respondents. The figure of US$1.8 billion seems to illustrate this. There were 5 respondents from Australia and none from New Zealand, which almost certainly means that the effects of nematodes on white clover and potatoes, to name just two, will have been omitted from the final figure. The revised figures for Australasia are presented elsewhere in this issue, and are a considerable portion of the total for the world. Hence the value of $1.8 billion per annum must be regarded as an underestimate.

The paper acknowledges that there were probably varying interpretations of the questions in the recent survey, as well as different ideas of what costs should be included and methods for calculating them. To my mind, it is worth exploring the ideas behind the figures further, and examining what figures might be produced using different metrics. In a world increasingly driven by economic justifications of benefits and costs, the size and interpretation of the estimated impacts of nematodes on agriculture could have considerable influence on funding decisions. It also seems likely that any simple figure will be used without consideration of what it represents, and so it is worth having the basis of an oft-quoted figure made clear, as well as other figures easily available for other measures of impact.

The other reason for considering the various measures of the impact of nematodes on agriculture is that it may highlight gaps in our understanding of nematodes in cropping systems. While we can quantify some things very well, others we really have very little data on.

The relationships of the various concepts can be summarised by the following equations.

	current direct quantified losses reported in survey
+	current direct quantified losses not reported in survey
=	current direct quantified losses

	current direct quantified losses
+	current direct unquantified losses
+	cost of mitigation, management or control
+	cost of nematode research
+	current indirect quantified losses
+	current indirect unquantified losses
=	current total cost of nematodes

	current direct benefits
+	current indirect benefits
=	total benefits of nematodes

	potential direct costs of nematodes
+	potential indirect costs of nematodes
=	potential total costs of nematodes

	potential total costs of nematodes
—	current total costs of nematodes
=	benefit of nematode research

	current total cost of nematodes
+	total benefits of nematodes
=	total impact of nematodes

Considering again the figure of US$1.8 billion as the costs of nematodes in agriculture using the framework above, it is immediately apparent that this represents only the first value stated above, that is, *current direct quantified losses reported in survey*. This is only one relatively small part of the total impact of nematodes on agriculture.

Of the many other aspects adding to the total impact, some can be quite easily evaluated, such as *current direct quantified losses not reported in survey*, and hence also *current direct quantified losses*. Estimates of these values are presented elsewhere in this volume. From there on though, the figures become increasingly difficult to estimate, though not necessarily less important.

Are there *current direct unquantified losses*? Put another way, are there nematode problems we do not know about yet, or haven't realised that they are caused by nematodes. I would suggest that there probably are losses of this sort since new nematode problems are constantly appearing as we deal with older ones. The emergence of losses due to *Pratylenchus* after largely effective control of *Heterodera avenae* is an example. Because the emerging nematode issues take a while to develop and be recognised, our estimates of the effects will, I suggest, always lag somewhat, and the losses will be unquantified. The environmental effects of nematicides on non target organisms is another unquantified loss.

Cost of mitigation, management or control is, I suggest, frequently underestimated. Most of the things that are routinely done to manage nematodes, are done so automatically that they are taken for granted. Because of this, the potentially greater returns from alternatives that would be available without having to consider nematodes are seldom considered. There is also the issue that many nematode management techniques like crop rotation are also used to manage other pathogens, but how the costs should be apportioned between the nematode and other organisms involved is problematic. Direct costs like nematicides can be easily quantified. The cost of nematode testing is harder to evaluate, but nevertheless intrinsically tractable. Costs of developing and deploying resistant varieties also have to be included here. The costs of internal and external quarantine, together with the development of guidelines and regulations also needs to be included here. Again, some of these costs need to be shared with other organisms. The above are not a complete list, but hopefully illustrate that this term is probably substantial when estimated completely.

The *cost of nematode research* is a relatively small value compared to most of the others being considered. I am not aware that this has been evaluated recently—perhaps someone can direct me to it if it has—but this would be interesting to compare with some of the other figures being discussed.

The two terms for *current indirect losses* refer to the losses where nematodes increase susceptibility of crops to other pathogens like fungi, facilitate infection, or have synergistic effects. I suggest that the total value of the indirect loss terms may be quite high, but that the *unquantified* term is much larger than the *quantified* term. In most cases we have very little data on how nematodes increase susceptibility to other disease agents.

The net result of considering all the above terms is that the sum of them gives the *current total cost of nematodes* and this figure will be very much larger than just the *current direct quantified losses reported in survey*.

In considering the total impact of nematodes on agriculture, I would suggest that the good also needs to be considered, hence terms for *current direct benefits*, *current indirect benefits* and *total benefits of nematodes*. Included in these terms will be things like biological control agents, consumption of pathogenic fungi or other nematodes in the soil, stimulation of soil bacteria, nutrient mobilisation and other "ecosystem services". Most of these benefits are currently unquantified, and could only be estimated very approximately. Nevertheless, the studies that have been completed indicate that there are very substantial values involved. It is only when these processes are altered in controlled experimental conditions like microcosms that their magnitude can be easily measured in what is otherwise a very complex system in the field.

The terms that I think are most forgotten are the *potential direct costs of nematodes*, *potential indirect costs of nematodes* and *potential total costs of nematodes*. These represent what would happen without any management for nematodes at all. This is hard to imagine, but in many cases the result would be crop failure. Imagine growing susceptible tomatoes (because the original domesticated varieties were susceptible) year after year with the Root-Knot Nematodes having a ball; or CCN-susceptible wheat grown almost anywhere in southern Australia. In other cases the results may not be quite as dramatic, but would be very substantial. The geographic distribution of the various pathogenic nematodes would also need to be considered when evaluating potential impacts. The point is that the potential impacts of nematodes are huge, and that large-scale losses to nematodes did occur before we knew about nematodes without the management measures that are now taken for granted. The fact that many of the steps taken to manage the effects of nematodes on crops are taken for granted makes the potential costs of nematodes very difficult to evaluate. Nevertheless, I suggest it is important to recognise that without resistant varieties, non-hosts in a rotation, plant hygiene and all the rest, nematodes would be having a very large effect on crops.

The difference between the very large, oft ignored, and inadequately quantified *potential total costs of nematodes* and the substantial, more considered, but still imperfectly known *current total costs of nematodes* yields the *benefits of nematode research*. This is one of the most important numbers in the whole equation. I would suggest it is very large because the potential costs are so much more than the current realised costs. Furthermore the benefits are large in relation to the *costs of nematode research* which was considered above. This is a high benefit:cost ratio. Yes, there are a lot of difficulties and uncertainties in evaluating it, but it is a number which needs to be estimated and quoted to funding bodies. I suggest that we have not done this enough in the past.

The difference between the potential benefits from nematodes and the *total benefits of nematodes* could be added to the value of research as well. The estimation of the total potential benefits is probably so far off that I have not included it in the equations above.

Having considered all the above, the *total impact of nematodes* on agriculture can be evaluated by adding the benefits and the costs. From the discussion above it is entirely conceivable that this figure is over US$1.8 billion per annum for Australia alone…not even counting our neighbours across the ditch. Whatever it is, the total impact of nematodes, properly evaluated, must be a very large number.

In a way, the considerable successes of nematology, and the high benefit to cost ratio of research, threaten to see nematology underestimated as a very valuable contributor to agriculture. Hopefully, considering the issue at some length, as I have here, will highlight the real benefits and costs of the various aspects of the ways that nematodes interact with agriculture, and how we might go about estimating them. If it also focuses attention on some areas that we need to know better, that is an added bonus.

Likewise, anything which stimulates thinking about these issues is useful. In this respect, I am very glad that the original paper was presented by Wesemael at 5ICN. Although it may have some deficiencies, the survey at least provided a starting point, and it has stimulated people to produce a better estimate, at least in Australasia. To my mind this is the sort of thing that plenary sessions in International Conferences should be doing, so the organisers of the session (John Webster and Rosa Manzanilla-Lopez) should be congratulated.

MY CURRENT RESEARCH PROGRAM

Graham Stirling
Biological Crop Protection, Mogill

Since I have my fingers on the keyboard, I thought I'd provide a summary of the work I am currently doing. You may not be interested in crops such as ginger and sugarcane, but I suggest the research approaches and results are relevant to other crops.

Soil-borne diseases of ginger

This ACIAR-funded project involves work in Australia and Fiji.

- I have just submitted a paper to APP on Pythium rhizome rot of ginger. This is a severe problem on ginger retained for planting material in Fiji, and we found the disease for the first time in Australia during the very wet summer of 2007/08.
- We have demonstrated in a field experiment at Kandanga that ginger can be grown in a controlled traffic/permanent bed farming system, with both ginger and rotation crops being planted with minimum tillage equipment. The main problem was that ginger yields were lower in the minimum till system, probably because soil temperatures early in the growing season were lower under trash cover. We will tackle this issue in the next ginger planting, which is due in September 2009.
- Three years of bioassay work at Yandina has clearly shown that increasing organic matter levels through organic amendments and reduced tillage increases the general suppressiveness of soils to root-knot nematode. A field experiment next year will give a better indication of the level of suppression that can be obtained.
- *Radopholus similis* multiplies on ginger rhizomes in Fiji and causes major losses in ginger crops that are retained for seed. We have found a site where the nematode is causing problems and are now studying the etiology of the disease and looking at the host status of the most important rotation crops (cassava and taro). We also have some initial data to suggest that Australian populations of *R. similis* will also damage ginger. This raises the question as to why we haven't seen burrowing nematode problems on ginger in Australia, as the nematode occurs on banana in our ginger-growing areas.

Nematodes on sugarcane

The farming systems work done in the Sugar Yield Decline Joint Venture was summarised in a recent review (APP 37, 1-18). One consequence of that work was the introduction of soybeans and peanuts into the sugarcane farming system. This means that we now have enough grain crops in the Bundaberg region for GRDC to provide some research funds. Thus I am now involved in a new project (funded by both GRDC and SRDC) that focuses on improving the integration of sugarcane and legumes. We are also introducing winter cereals into the farming system, as wheat, barley and oats provide growers with additional income and fortunately, they don't seem to increase populations of *Pratylenchus zeae*.

Currently, most of my work is in the following areas:

General suppression of nematodes. I have previously shown that reducing tillage and retaining crop residues increases soil C levels and enhances the general suppressiveness of soils to *Pratylenchus* and *Meloidogyne*. I am now trying to find out the quality and quantity of C required to sustain biological activity at levels that will provide useful suppression of nematodes. One interesting observation is that the soil just under the trash blanket (which has the highest soil C levels) has much healthier roots than further down the profile. This soil is also very suppressive to *Pratylenchus* (there are 4-5 times fewer nematodes/g root in the 0-2 cm zone than in the 15-20 cm zone). I am also looking at the impact of the C/N ratio of organic matter on suppression, and hope this will lead to a better understanding of the fungi and other organisms that are involved in suppressiveness.

Specific suppression of *Meloidogyne*. In some situations (e.g. sandy soils that are ideally suited to root-knot nematode), general suppressive forces may not be effective enough to reduce nematode populations to the levels we require. I am therefore studying the impact of specific parasites on nematode population dynamics. *Pochonia chlamydosporia* and *Paecilomyces lilacinus* can be isolated from egg masses in sugarcane soils, and the bacterial parasite *Pasteuria penetrans* also occurs in most fields. However, levels of parasitism are never very high. Since the nematode has been present in sugarcane fields for 50-100 years, this raises the question as to why these relatively specific parasites have not increased to the point where they provide significant levels of control. Hopefully I can find the answer in the next couple of years.

Nematode resistance in sugarcane

All current sugarcane varieties are susceptible to *Meloidogyne* and *Pratylenchus*, and although there is an active sugarcane breeding program in Australia, nematode resistance has never been part of it. I am currently involved in two projects in this area:

- In initial pot tests, we have found resistance to both *Meloidogyne* and *Pratylenchus* in germplasm derived from crosses between *Saccharum* and closely related genera.
- I am collaborating with BSES and Jenny Cobon from DPIF in new project where we will be screening transgenic sugarcane plants for resistance to *Meloidogyne* and *Pratylenchus*.

New book on biological control

My book on biological control of nematodes was published in 1991. Keith Davies and Itzik Speigel are now editing a new multi-authored publication which will update that book. I have just written the first chapter for the new book, which will be published by Springer in 2009.

Reviews

"An Anecdotal History of Nematology"

J.M. Webster, KB Eriksson and D.G. McNamara (eds) 2008
Pensoft Publishers, Sofia-Moscow, 200 pp.

Available from www.pensoft.net

This book is a great read for all those who love their little critters, and provides a humorous and enlightening historical account of the people, personalities and places that have influenced our understanding and study of nematodes. The history is brought to life through the accounts of the collected authors, accompanied by numerous photographs. You may even recognise some of the faces.

The book consists of 18 chapters, from "early stars" through to "dreams and visions of the future". Along the way, we learn how significant developments in nematology came about, as well as the history of research on specific nematodes (notably PCN, CCN and SCN). Other chapters discuss the diverse topics of taxonomy, molecular techniques, virus-vector nematodes, impacts on crop production, nematology in developing countries, quarantine and biocontrol.

My favourite chapter would have to be "First catch your nematode…" in which David McNamara eloquently voices what I have always thought – "…unlike their colleagues in plant pathology or entomology…nematologists must dig up quantities of heavy soil, carry it back to the laboratory and then engage in complicated and difficult procedures involving lots of water before they can get a sight of their little creatures". Of course the majority of these methods retain the name of their inventor (Fenwick, Seinhorst, Oostenbrink, Baermann *et al.*) so take heart – "if you want to be remembered as a nematologist, invent an extraction technique."

Vivien Vanstone

"Integrated Management and Biocontrol of Vegetable and Grain Crops Nematodes"

A. Ciancio and K.G. Mukerji (eds) 2008
Springer, The Netherlands, 356 pp.

This book is a useful, up-to-date introduction to management of nematodes of broad-acre grain crops, and vegetable crops grown on a much smaller scale. References to 2007 literature are common, suggesting that contributions to this volume were either written relatively recently, or revised close to publication date.

The editors have encouraged a multidisciplinary approach to discussions of integrated management and biocontrol, and the book aims to present a 'more holistic vision of management'. Various case studies of management, from West Africa to South America to North America, are presented. This is of particular interest as management within 'self-consumption' systems was largely ignored in earlier technical books of this nature. The comparison of management of *Heterodera glycines* on soybean in Argentina vs the USA (ch's 6, 7) is insightful. In both nations, there is emphasis on development of resistant soy lines to manage the nematode and discussion of use of biological agents, but there seems to be more awareness of the need to educate farmers in Argentina. Gregory Noel is also arguing for production of soybean every third or fourth year, rather than every second year as at present in the USA.

The book has four sections: Nematodes in Biological Control, Crops Ecology and Control, Technological Advances in Sustainable Management, and Data Analysis and Knowledge-based Applications, and fifteen chapters in all. Topics covered include potential of predatory nematodes for biocontrol, integration of biocontrol with other methods of management, nematophagous fungi; soil conservation for control and management, management of nematodes in tuber and grain crops in the Andes (which introduced me to the edible tubers oca, mashwa and ullucu); IPM of *H. glycines*, nematode management in cotton; potential of RNA interference for management of plant parasitic nematodes, potential use of *Pasteuria*; management of *H. schachtii*, biofumigation; application of knowledge for control of *H. avenae* in both broad acre and self-consumption systems, management of *Meloidogyne* in Mediterranean horticulture (a testament to the adaptability of these nematodes), and modelling nematode 'regulation' by bacterial endoparasites. As might be expected given the approach this book takes, the authors are a mix of well known (e.g., Bilgrami, Kerry, Jansson, Doucet, Robinson, Nicol, Rivoal) and lesser known workers.

Chapter 2 attempts to review the integration of biological control with other management practises, and includes crop rotations, antagonistic plants, resistant cultivars, soil solarisation, biofumigation and nematicides. It also considers methods to increase soil microbes and their diversity (organic amendments, green manures, and companion crops). Use of nematicidal plants as intercrops for control of *H. schachtii* in northern Italy (Ch. 11) was particularly instructive.

In Ch. 4, management of soil fertility and of nematode populations is considered in the context of soil conservation. Emphasis is given to the multitrophic relationships occurring in the soil – between nematodes and plants, nematodes and antagonists, plant health, etc. A holistic approach is urged. The arguments advanced were reminiscent of those of Prof. H.R. Wallace, and it was disappointing to find no references to his work.

Use of DNA technologies for nematode management has promised much, but has not yet delivered. RNAi (Ch. 9) is one such technology that could become a useful tool in some farming communities, and it was good to see it reviewed in this book.

If I have a nit-pick about this useful book, it is that it bears the hallmarks of hasty production. This illustrates the problem of balancing production of a 'current' work vs. that of a 'polished' volume. Springer Verlag really could have insisted on more careful proof-reading. A couple of small examples – 'prof.' for 'Prof.' (line 1 of the Preface), and 'Gibkin-Davis' for 'Giblin-Davis' on pages 87 and 95.

It is good to see a book on nematode management emphasising inclusive approaches, and consideration of the soil. This reference book should be included in all agricultural libraries. It will be useful for both students and practitioners such as agronomists, and will hopefully raise awareness of alternative methods of nematode control – particularly for horticulture.

Kerrie Davies

Other News and Comment

DR GRAHAM STIRLING HONOURED AS A FELLOW OF THE SOCIETY OF NEMATOLOGISTS

Source: Society of Nematologists Newsletter 2008, 54(2)

Dr Graham Stirling was raised on a wheat and sheep farm on Kangaroo Island, Australia. He completed his B.Sc. (Honors) and M.S. degrees at the University of Adelaide, where John Fisher introduced him to the fascinating world of nematodes. Graham began his professional career as a Nematologist with the South Australian Department of Agriculture at Loxton in 1970 where he worked with *Meloidogyne* spp. on grapevine. Graham was awarded a CSIRO Post-Graduate Studentship in 1975, which allowed him to move to the University of California, Riverside. There he began a lifelong interest in biological control of nematodes, working with Ron Mankau. Graham discovered a new parasite of root-knot nematode eggs (*Dactylella oviparasitica*) and demonstrated the importance of biological control in suppression of nematode populations in some Californian peach orchards. He was awarded his Ph.D for that work in 1978.

FOUR HISTORICAL RESEARCH BULLETINS PUBLISHED

These significant manuscripts were written by the late Dr F.G.W. Jones (nematologist, Bulletins 3 and 4) and Dr M.G. Jones (entomologist, Bulletin 1), both formerly of Rothamsted Experimental Station, UK, and by Dr R.A.C. Jones (virologist, Bulletin 2). They have now been published as bulletins of the F.G.W. Jones family historical series and are available as PDF files by downloading from the web site, www.geocities.com/macdougalljones, or by email from smacdougall@actewagl.net.au.

F.G.W. Jones (2008) *. Modelling the within-field spread of the potato cyst-nematode, *Globodera rostochiensis* Woll. *Bulletins of the F.G.W. Jones family historical series,* No. 4, 46p. Canberra, Australia. ISSN 1833-5519 (print); 1833-5527 (online). [Written - 1987]

F.G.W. Jones (2007)*. A contribution to the epidemiology of the cyst nematodes *Heterodera schachtii* Schm., *Globodera rostochiensis* Woll. and *G. pallida* Stone in north-west Europe. *Bulletins of the F.G.W. Jones family historical series,* No. 3. Canberra, Australia, 38p. ISSN 1833-5519 (print); 1833-5527 (online). [Written - 1993]

R.A.C. Jones (2007) Hypothesis to explain how viruses induce production of local lesions in plant tissues. *Bulletins of the F.G.W. Jones family historical series,* No. 2. Canberra, Australia, 36p. ISSN 1833-5519 (print); 1833-5527 (online). [Written - 1970]

Jones, M.G. and Fletcher, K.E. (2006) * Use of controlled environment chambers to simulate the effects of wheat bulb fly larvae *(Delia coarctata)* on developing winter wheat plants. *Bulletins of the F.G.W. Jones family Historical Series*, No. 1, Canberra, Australia, 24p. ISSN 1833-5519 (print). [Written - 1976]

*Published posthumously.

DITYLENCHUS DESTRUCTOR DOES NOT OCCUR IN AUSTRALIA

Source: EPPO Reporting Service No. 5 Paris, 1 May 2008, 2008/106

In Australia, although the presence of *Ditylenchus destructor* (EU Annexes) had been reported in the past in New South Wales, South Australia, Tasmania, Victoria, and Western Australia, investigations in each individual states (see below) have shown that all these records were erroneous. In addition, recent surveys or surveillance programs carried out in Australia have failed to detect this nematode.

The situation of *Ditylenchus destructor* in Australia can be described as follows: **Absent, all previous records arose from taxonomic confusion with other *Ditylenchus* species or were erroneous, confirmed by general surveillance.**

New South Wales: there was a single published record for *D. destructor* mentioning that it was found in mushroom compost (Anon., 1959). No other records have been made since 1959. It is now considered that this old record was based on a misidentification of *D. myceliophagus,* a species which was first described in 1958 and closely resembles *D. destructor*.

South Australia: the nematology diagnostic service which has been operating for many years has never detected the presence of *D. destructor* during the testing of a wide variety of susceptible hosts. The record appearing in the EPPO datasheet is considered erroneous.

Tasmania: a paper from Thistlethwayte (1961) seems to be the source of the suggested presence of *D. destructor* in Tasmania which was later quoted in other publications. It is now considered that this most probably resulted from confusion with *D. dipsaci*. Since 1992, Tasmania has undertaken annual surveys of 20% of its potato crops for other nematodes (*Globodera* spp.) and if *D. destructor* was present these surveys should have detected it. In addition, extensive surveys for nematodes have recently been conducted on carrot crops (host plants) in Tasmania and *D. destructor* was not found.

Victoria and Western Australia: *D. destructor* has never been detected in any targeted or general surveillance programs and there have never been any published records concerning these states. Earlier records appearing in the EPPO datasheet are considered erroneous.

References

Plant Biosecurity Australia, 2008-06.

Anonymous (1959) *The Agricultural Gazette of New South Wales* 70, 648-650.

Thistlethwayte B. (1961) Plant diseases caused by eelworms. *Tasmanian Journal of Agriculture* 32, 197-205.

LET'S RE-ESTABLISH A PUBLISHING CULTURE

Graham Stirling
Biological Crop Protection, Mogill

In compiling the recent Nematology feature for APP, one disappointment was that some authors had to cite annual reports, conference papers, reports to funding bodies and newsletter articles because they had never formally published their results. Some referees were quite critical of this practice, and I agree with them. The primary responsibility of a scientist is to publish their work in peer-reviewed journals so that methods and results are available to everyone. The previous generation of nematologists did a good job of this (see APP 37, 203-219) and it is up to us to continue the tradition.

I don't have a problem with data being included in Australasian Nematology Newsletter, as it is a timely way of informing others of your results. However, this practice is only acceptable if the work is also published in a reputable journal. ANN was never intended to be a citeable publication.

I know everyone thinks they are too busy to write, but it is really a matter of self-discipline, and recognising that a piece of work is not finished until it is published. We all have to write reports, and it doesn't take a lot of extra effort to turn those reports into acceptable papers.

Given that most nematological work is a combination of field, glasshouse and laboratory studies, it is not unreasonable to expect nematologists to produce at least 1-2 papers/year. Someone producing 50 to 60 papers in a 35-year career is not only contributing to the pool of knowledge that we all depend on, but is also leaving behind a legacy that can be built on by the next generation of nematologists.

ANNOUNCEMENT

NEXT "NEMATODE IDENTIFICATION AND TECHNIQUES" COURSE

An intensive training course on "Nematode Identification and Techniques" will be held under the joint auspices of CSIRO Entomology and The University of Adelaide. Course co-ordinators are Drs Mike Hodda and Kerrie Davies.

Aims

The course will cover identification of plant, soil and insect nematodes, together with techniques for sampling, extraction, experimentation and analysis. The course is aimed at professionals in plant and insect pathology, pest management, soils and other disciplines dealing with nematodes. Sufficient background will be presented to enable those with limited experience to benefit fully from more advanced aspects.

Details of course content will be varied to suit the interests of the participants. At present issues given particular emphasis will include Potato Cyst Nematode and nematodes in turf and horticulture. Beneficial nematodes will also be discussed. Please contact the co-ordinators to discuss any specific needs or topics desired for inclusion.

Dates and cost

The next 5 day course will be held from the **5-9 October in Newcastle** immediately following the Australasian Plant Pathology Society Biennial Conference. The venue will be either the University of Newcastle or Newcastle Technical College Tighes Hill. The cost for this course will be $1650 incl. GST (AUD), depending on the number of participants.

An **information and enrolment form** for the 2009 course is available as a PDF file (44KB) at:

www.csiro.au/resources/pfgw.html

Please register your interest now (non-binding), to assist with planning. Also, please note that the course is limited to 15 participants to ensure individual attention.

To discuss specific needs please contact:

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