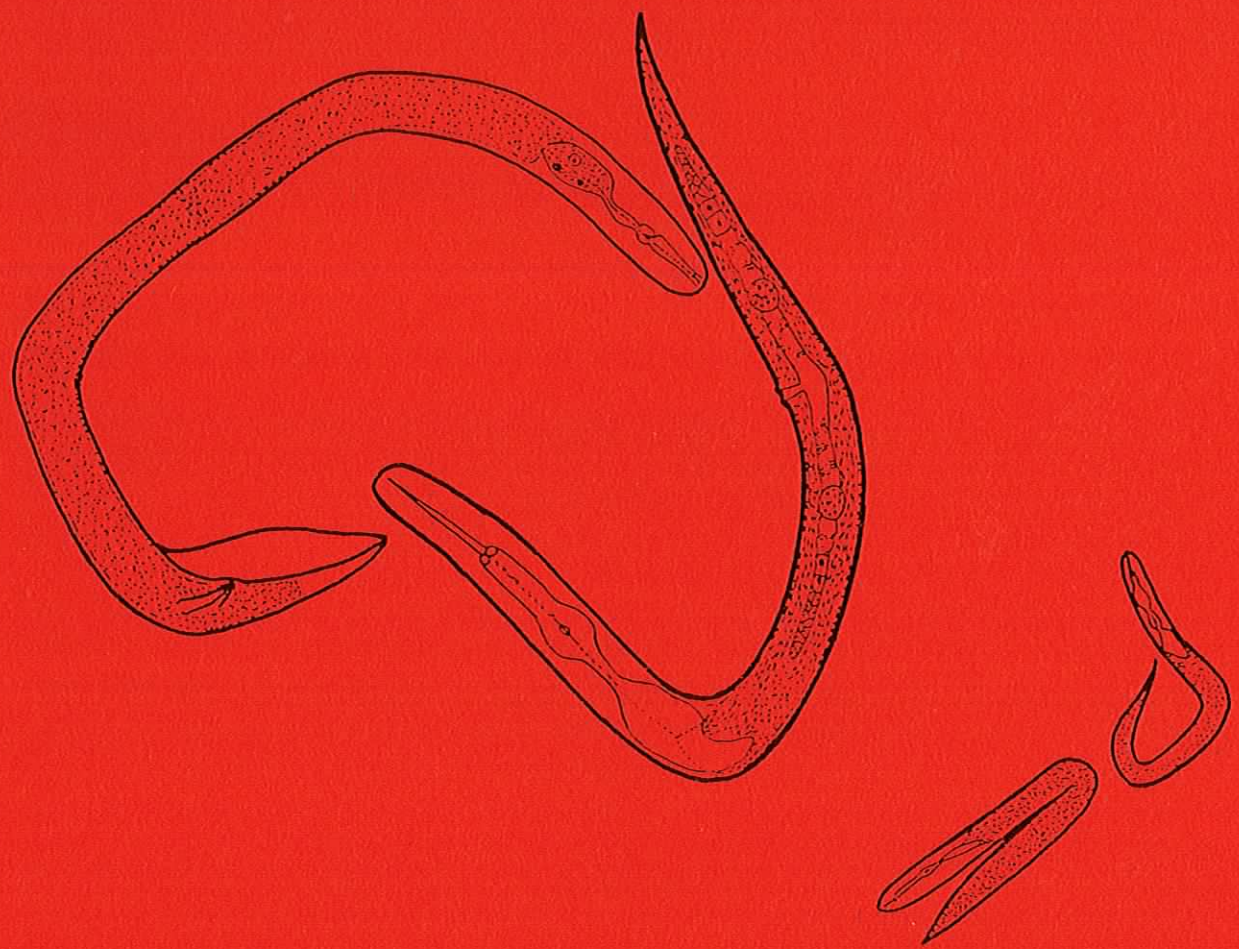
AUSTRALASIAN NEMATOLOGY NEWSLETTER



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FROM THE EDITOR

Thanks again to those who have contributed articles for this newsletter. I must apologise for some confusion I created by advertising the deadline firstly as 19 June and later, 19 July. The deadline for the January 1993 edition will be 18 December 1992.

Send articles to:

Russell Eastwood
Victorian Institute for Dryland Agriculture
Private Bag 260
Horsham Vic. 3400
Australia

The restructuring of science in New Zealand is topical at present, with two articles included in this addition. As many of we Australians are employed in government or semi-government agencies and the future being somewhat unsure, the New Zealand experience should be of interest to us all.

Welcome to our eight new members, it is encouraging to see our association continue to grow in numbers, but I encourage you to become active participants. The association was formed three years ago and essentially the same group of people have been running it since then. An opportunity for change of office bearers will occur at the next APPS conference in Hobart, July 1993. Take some time to think how you might help AAN.

It has been suggested that the cover of ANN does not include Tasmania, but let me assure you the nematode representing the east coast of Australia dips well below Wilson's Promontory.

ASSOCIATION NEWS

It is about four years since AAN was established and after an initial burst of activity I am concerned that interest in the Association seems to be beginning to wane. Two observations support that view:

1. There are few unsolicited contributions to the newsletter and Russell Eastwood has had to resort to telephoning people for articles.
2. The difficulty we are having in finding someone willing to organise a workshop at the next APPS conference (see article elsewhere in this newsletter).

Our membership includes virtually everyone in Australia and New Zealand with an interest in plant-parasitic nematodes and if everyone contributes in some way the Association will continue to progress. I know each of us is having to cope with funding problems and increasing workloads, but please consider whether you can do more to improve communication amongst nematologists and to promote the discipline to the outside world.

(G R Stirling, Queensland Department of Primary Industries, Brisbane)

PRATYLENCHUS WORKSHOP

At our general meeting in Sydney last year it was agreed that we would hold a workshop on *Pratylenchus* at the next APPS meeting (Hobart, July 1993). *Pratylenchus* was suggested because several new projects were commencing and it was felt that it would be useful if people had the opportunity to discuss techniques and problems before these projects proceeded too far.

Chris O'Brien originally offered to help organise the workshop but he recently took up a managerial position in Townsville and is no longer in a position to help. Consequently, I am looking for someone else to arrange a programme (the Conference organising committee can make the local arrangements). I have already tried several people without success.

I think it is important to have a strong nematology section at the conference and this is more likely to happen if we also hold a workshop. Please contact me by the end of August if you can help in some way.

(G R Stirling, Queensland Department of Primary Industries, Brisbane)

NEW MEMBERS

Mrs Monica I Haak
Queensland Department of Primary Industries
Queensland Wheat Research Institute
Holberton Street
Toowoomba Qld 4350
Telephone: (076) 346644
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Pratylenchus thornei - effects of fallow management strategies

Mrs Lila Nambiar
Department of Food and Agriculture
Institute of Plant Sciences
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Burnley Vic. 3121
Telephone: (03) 8101546
Facsimile: (03) 8195653

Diagnostic work
Control measures
Safe use of nematicides
Potato cyst nematodes

Mr Han Eerens
NZ Institute Pasture and Animal Research Ltd
Private Bag
Gore
New Zealand
Telephone: (03) 2089015
Facsimile: (03) 2089017

Plant interactions (pastoral)
Endophyte relation

Dr Sergio Galper
Macquarie University
School of Biological Sciences
Sydney NSW 2109
Telephone: (02) 8058221
Facsimile: (02) 8058174

Interactions with soil micro-organisms
Biological control

Dr Kerrie A Davies
Department of Crop Protection
University of Adelaide
Waite Agricultural Research Institute
Glen Osmond SA 5064
Telephone:
Facsimile: (08) 33811757

Growth and development of nematodes
Entomophilic nematodes

Ms Janine Lloyd
Department of Crop Protection
University of Adelaide
Waite Campus
Glen Osmond SA 5064
Telephone: (08) 3722255
Facsimile: (08) 3381757

Entomophilic nematodes

Ms Kate Strachan
Penfolds Wine Group
Tanunda Road
Nuriootpa SA 5355
Telephone: (085) 620269
Facsimile: (085) 620424

M. javanica
Nematode ecology, distribution, management
Effects on grape vines

Mr Richard N Watson
NZ Pastoral Agricultural Research Institute Ltd
Ruakura Agricultural Centre
Private Bag
Hamilton
New Zealand
Telephone: (071) 38531
Facsimile: (071) 385073

Pasture nematology: white clover tolerance, demography, rhizosphere ecology
Kiwifruit nematology
Biological/chemical/managerial control

CURRENT RESEARCH

REVISION OF GEORGE KHAIR'S LIST OF PLANT PARASITIC NEMATODES OF AUSTRALIA

Revision of the plant nematode list has recently been commenced by Rod McLeod and Frances Reay, as George Khair is no longer able to continue with it.

The last edition of the list was on disc, but unfortunately during a changeover of computer systems, this was lost. Information from Rod McLeod's list of nematodes from NSW has been entered on disc, and work has started on entering information from George Khair's list.

For the new edition, we intend to include collection numbers, wherever available, and references for all published records. There will also be due acknowledgments for contributions of information. Layout for the species of nematodes, has not yet been finalised. The host list will be retained. There is a tentative proposal to include also, an illustrated key to Australian plant parasitic nematodes.

Suggestions and comments are welcome. Where these relate to layout or type of information to be included (rather than new records), please let us known soon - at the latest, by the end of September 1992.

Would you please let us know if you have new records (i.e., records not in Khair's 3rd edition) - published or not, for inclusion in the list. The type of information required is given below. Please send details to:

Rod McLeod
Biological and Chemical Research Institute
Rydalmere NSW 2116

or

Frances Reay
University of Adelaide
Waite Campus
Glen Osmond SA 5064

There are various typographical and nomenclatorial errors in the last edition. If you feel there are any we might overlook, please let us know. Few publications are error free, but we would like to reduce our errors to a minimum!

INFORMATION REQUIRED FOR EACH NEW RECORD

- Nematode - genus and species, where known
- Host plant - including cultivar if applicable
- Locality
- Collection number - or place where reference material is held
- Published record - please give details

OLD RECORDS

In order to add collection numbers, we will be relying on the co-operation of those who have supplied records in the past, to check their material as to a collection number.

Details of progress and a closing date for new records will be given in the next newsletter.

(Frances Reay, Waite Agricultural Research Institute, Unviersity of Adelaide, Glen Osmond, South Australia)

THE BENEFITS OF ENTOMOPATHOGENIC NEMATODE USE IN CHINA

INTRODUCTION

In 1991, the Australian Centre for International Agriculture Research (ACIAR) renewed and substantially increased financial support for further development of entomopathogenic nematodes in China. The principle aim of this project is to demonstrate on a large scale the use of entomophatogenic nematodes as biological control agents of insects. This involves collaboration between the CSIRO Division of Entomology, the Biological Control institute of CAAS, Beijing and Guangdong Entomological Institute, Guangzhou. It is hoped that this work will be a showcase to the rest of the world of the value of entomopathogenic nematodes, and demonstrate the role they can plan in lessening our dependence on chemical insecticides. There are two major components to this project:

1. demonstrating the economics of large scale mass production, storage and shipment of entomopathogenic nematodes, and
2. demonstrating the effectiveness of nematodes in large scale field efficacy trials.

PEST PROBLEM

The major target insect is the oriental peach moth, *Carposina niponensis*, a serious pest threatening 70% of China's 1,000,000 ha of apple orchards, which produce $17 billion worth of

apples annually. This moth lays its eggs on the surface of the developing apples and the larvae bore into the fruit causing damage similar to that caused by codling moth. However, unlike the larvae of codling moth, which predominantly pupate on the tree, the larvae of *Carposina* drop to the ground or emerge from fallen fruit and overwinter in the soil. In late May - early June as soil temperatures rise and the rains come, the larvae emerge from their overwintering cocoon and migrate towards the soil surface to pupate. It is during this fateful journey to the surface that the larvae are most susceptible to attack by infective stage larvae of *Steinernema carpocapsae*. Soil surface application (using conventional spray machinery) of the nematodes is timed to coincide with this migration of the peach bor er larvae, and greater than 95% mortality of larvae is routinely achieved. Indeed, field trials over the last six years have demonstrated that entomophatogenic nematodes give as effective or better control than soil insecticides.

MASS PRODUCTION AND STORAGE

Robin Bedding (project leader) has responsibility for mass production and has instigated the establishment of pilot production facilities in Beijing and Guangzhou, each capable of producing hundreds of billions of nematodes per annum. The potential value of entomophatogenic nematodes has already been favourably assessed by an independent economist (Doeleman 1990), it is hoped that this phase of the project will turn his economic projections into commercial reality. Underpinning this effort, in Australia Robin is leading a project directed at further improving the shelf life of entomopathogenic nematodes. This work includes fundamental studies on the biochemistry and physiology of the infective stage nematodes as well as work on improving formulation and packaging.

FIELD EFFICACY

My responsibility is the planning and evaluation of large scale efficacy trials, and strategic research on improving the field efficacy of entomophathogenic nematodes. In March of this year, I met with our collaborators in Tai'an, an ancient, sacred city in the heart of the apple growing region of Shandong Province. The results of the 1991 field season were evaluated and this year's trials planned. In 1991, nematodes were applied to 132 ha (1,980 mu, 15 mu = 1 ha) of apple orchard. Overall, in application rates ranging from 60-100 million nematodes per mu, nematodes provided effective control of *Carposina*. In 10/12 orchards (=92% of treated area) nematode treatments kept the percentage of apples infested with eggs equal to or less than 1% (the threshold for foliar pesticide applications). In 8/9 orchards, nematode treatments were better than soil chemical applications. This data further confirms the effectiveness of entomopathogenic nematodes. This year, 250 ha will be treated with nematodes, 500+ ha in 1993 and there is a target of 1,000+ ha in 1994, making these the largest field applications of entomopathogenic nematodes in the world.

Concurrent with these extensive field trials, I am conducting smaller scale experiments aimed at improving application technology as well as developing even more effective strains of *S. carpocapsae*. It is anticipated that this research will dramatically reduce application rates and thereby costs, and make entomopathogenic nematodes an even more attractive control option for apple growers.

Carposina control is the major focus of our research in China over the next three years. Besides its obvious economic benefits to China, this project is providing us with much fundamental information required to demonstrate and increase the attractiveness of

entomopathogenic nematodes as an alternative control method to chemical insecticides. It is anticipated that this will hasten their commercialisation and open up new markets for nematode products both within Australia and overseas.

FURTHER INFORMATION

Doeleman, J. A. (1990). Benefits and costs of entomopathogenic nematodes: two biological control applications in China. Economic Assessment Series 4, Australian Centre for International Agriculture Research, Canberra, 15 pp.

Science Communications Unit, ACIAR (1991). Insect pest control using nematode worms. ACIAR Research Notes, RN7, 6/91, 4 pp.

These and other ACIAR publications can be obtained from Robin or myself, or from the Communications Unit, ACIAR, GPO Box 1571, Canberra, ACT 2601.

(John Curran, CSIRO Division of Entomology, GPO Box 1700, Canberra, Australian Capital Territory)

WHICH ROOT-KNOT NEMATODE IS THAT?

When I took on the task of developing DNA probes to identify species and races of root-knot nematode, I little realised what a frustrating experience it was going to be! The major stumbling block is that we do not have the luxury of being sure of a population's identity using other methods.

For practical purposes, when controlling root-knot nematode, the identity should indicate host range so that suitable management systems can be selected. Traditionally, identification has been based on morphology and host range with perineal pattern being important. In my recent experience, perineal patterns are sometimes typical of a particular species but more often they appear to possess features of two or more types. Even within a single egg mass population, perineal patterns can vary enough to confuse the issue. Various publications have come out over the years which claim that identification can be made on the shape of the male head and stylet, juvenile tail, etc. This may be so with vast experience but frankly, to me, they all look the same! Furthermore, morphology does not indicate host range.

The standard host range test, using particular cultivars of capsicum, cotton, peanut, tobacco, tomato and watermelon, is often useful to differentiate the common races of the four most common species. However, confusion arises because the standard host range of *Meloidogyne javanica* and *M. arenaria* race 2 are identical while that of *M. arenaria* race 1 is different. Even admitting that the concept of species in a largely parthenogenetic genus is at least tenuous, it is hard to rationalise greater differences within than between species.

When host range tests are extended to more plant species, further differences within standard races are revealed. These differences are important for control. One can imagine that, the more such testing is extended, the more variation is found, perhaps revealing a continuum of root-knot nematode types with respect to host range.

Several recent publications have shown that some species and races can be identified using RFLP's of mitochondrial DNA (mtDNA). However, these tests have usually been based on studies of very few populations of each species or race. One assumes that these populations were chosen as typical of their species or race and, therefore, probably do not reflect the diversity which exists in agricultural soils.

In our experience, however, when studying mtDNA from our collection of about 100 root-knot nematode populations from around Australia, mtDNA is not a reliable indicator of a species or race which has been identified by the standard host range test. MtDNA evolves faster than nuclear DNA and should be the first indicator of genetic change which might affect host range. However, it may not be the mtDNA classification which is at fault here. Perhaps, the idea of dividing root-knot nematode populations into species was based on false premises. Biologists have always tended to group things which possess certain common characteristics (it seems to make life easier!). However, these common characters and the divisions based on them do not seem to be a true reflection of the nematode's biology. It may be as well to abandon the species/race concept of classifying root-knot nematode and to replace it with a system based on biological principles which indicates host range.

(Julie Stanton, Queensland Department of Primary Industries, Brisbane)

PRATYLENCHUS THORNEI IN VICTORIAN FIELD CROPS

During the 1991 growing season, a random survey of 18 chickpea crops in the Victorian Wimmera found some crops have high numbers of *P. thornei* in their roots.

Crops were sampled on 28 August 1991, roots from 8-25 plants (depending on size) were extracted in water on a mechanical shaker for six days at 24°C. Nematode numbers ranged from 190/g to 9,600/g wet weight of root. Dark brown to black corticular lesions 1-2 mm in length, elongated along the root axis, were observed, associated with high nematode numbers. This symptom gave the roots a mottled appearance to the naked eye.

At present, we do not have information relating nematode numbers to yield losses. A potential problem exists where chickpeas and wheat are grown in rotation as both are susceptible crops.

In a second trial on a red duplex soil at Charlton, Victoria, where wheat cv. Meering was sown, nematicide (Temik) application reduced nematode populations from 340 *P. thornei*/200 g to 60 *P. thornei*/200 g soil dry weight, but did not give a significant yield response. Recent evidence suggests *P. thornei* populations much higher than 340 *P. thornei*/200 g soil occur following chickpea crops in the Wimmera. We will be exploring this further in the future.

(Russell Eastwood, Victorian Institute for Dryland Agriculture, Horsham, Victoria)

REGIONAL NEWS

NEMATOLOGY IN NEW ZEALAND

All Government funded science in this country has been reorganised. The direct result of this action has been to split the discipline of nematology up and spread it between a number of New Crown Research organisations depending on the crop or current activity of the nematologist involved.

All science funding is now controlled and distributed by the Foundation for Science and Technology. They fund programmes for one to three year periods. To date, no nematology programmes have been funded for longer than one year. If a programme is not funded, the scientists in the project are also not funded as salaries are included in the costings. This policy came into force last year and as a direct consequence, Gordon Grandison was not fully funded and he chose to take early retirement. Gordon has continued to work on the control of nematodes in bowling greens.

The funding round has been completed for 1992/93 and all remaining nematologists have been successful in their bids and will be fully funded. This has meant that they will be transferred to the new Crown Research Institutes.

Chris Mercer has transferred to New Zealand Pastoral Agriculture Research Institute Ltd. Richard Watson has also transferred to this Institute and he is completing a major study on the impact of *Meloidogyne hapla* on the kiwi fruit plant. In the future, Chris and Richard will be working on nematode resistance in white clover.

Chris reports that he has identified sources of resistance in white clover to both *M. hapla* and *Heterodera trifoli*. This resistance is effective against a number of populations of both species of nematode. Studies this season will look at how this mechanism works. Han Eerens will also transfer to the Pastoral Institute. Han has started a Ph.D. and part of it is to study the interaction of nematodes and the presence of the *Lolium endophyte*.

Gregor Yeates will transfer to Land Care Research New Zealand Ltd., Manaaki, Whenua. Gregor continues to work on our New Zealand fauna and the ecology of nematodes, their role in nutrient partitioning in the soil root rhizosphere. Gregor will be spending some time in Adelaide with Alan Bird in the latter part of the year.

Wim Wouts will also transfer to Landcare New Zealand Ltd and continue his work on the classification of the *Helicotylenchus*.

John Marshall will transfer to the Institute of Crop and Food Research Ltd. He will continue developing molecular diagnostic probes for potato cyst nematodes using random and mitochondrial primers with the PCR machine. The genetic variation of different populations of *G. pallida* will also be examined.

He has also been able to do some basic biological studies on *Dirylenchus dipsaci* and the host specificity present in the populations will also be looked at. John has also started a small project to search for new sources of resistance to PCN in wild species of Solanum.

David Wharton is at the Zoo Department, University of Otago and has recently returned from a sabbatical. He continues to work on the mechanism of cold tolerance and anhydrobiosis in nematodes. David also runs a general nematology/parasitology course for undergraduates and postgraduates.

(John Marshall, DSIR, Christchurch, New Zealand)

NEW ZEALAND GOVERNMENT SCIENCE RESTRUCTURED

CSIRO and New Zealand's DSIR were created unequal. After 66 years, science in New Zealand was freed from the yoke of Departmental control on 1 July 1992. Now the "Crown Research Institutes" are registered under the Companies Act and have powers to borrow money, carry forward unspent funds (and debts), etc. The science allocation for 1992/93 shows a modest increase after eight years of decrease.

However, the science staff who have been "reconfirmed" as members of the staff of the 10 new Crown Research Institutes are not certain that they are, in effect, the lucky ones. The bulk of the funding for these Institutes is allocated to defined "outputs" by the Government's Foundation for Research, Science and Technology after an annual "bidding round". While some funding is long term (three years), scientists who have just been reconfirmed with the funding from 1 July 1992 are already working on bids for funding from 1 July 1993. The present economic situation is such that there is little commercial demand for those with "marketable skills".

Two mechanisms do bode well for the future. Firstly, the Government has commissioned a report on long-term funding priorities; reactions to this are presently being reviewed (recommendations included a shift from straight primary production to adding value by processing). Secondly, in addition to the specific "output funding" awarded, each of the 10 Institutes receives an additional 10% of "non-specific output funding" to be allocated by its management for purposes such as skill retention, new initiatives of "bailing out" staff whose bids failed in a particular year.

The "New Zealand experiment" is being watched from many countries. While there is no parallel control, the approach has bipartisan parliamentary support and is perhaps better than the (profit driven) State-Owned-Enterprise model previously suggested; the new Institutes are, initially, not required to pay a dividend, although profits will be subject to normal taxation. Immigration/emigration of staff, scientific publications and advances, and application of indigenous technologies over the next 5-10 years will indicate the success of the changes.

So it is farewell to DSIR, FRI, Communicable Disease Centre, and research arms of MAF and Met Service. Welcome to the Crown Research Institutes for:

- Environmental Health and Forensic Science
- Crop and Food Research (with nematology skills)
- Forest Research
- Landcare Research (with nematology skills)
- Atmosphere and Water Research
- Geological and Nuclear Sciences
- Social Research and Development
- Horticultural Products
- Industrial Research
- Pastoral Agriculture Research (with nematology skills)

(Gregor Yeates, Landcare Research, Lower Hutt, New Zealand)

GENERAL ARTICLES

AFRO-ASIAN JOURNAL OF NEMATOLOGY

This is a new, biennial publication of original research papers on all aspects of nematology, including plant, soil, fresh water, marine and invertebrate nematodes.

The journal is well produced, in A4 format, with high quality reproduction of figures and photographs (including SEM) on good quality paper. The contents for the two issues of Volume 1 (1991) reflect the interests of the Editor in Chief, M R Siddiqi, with all papers in both issues about plant and soil nematodes. Volume 1 comprises 240 pages.

Subscription details:

Membership of Afro-Asian Society of Nematologists . . . . . US$10 or £5
Subscription to Afro-Asian Journal of Nematology
Members of AAN . . . . . US$60 or £30
Members of ESN, ONTA and SON . . . . . US$70 or £35
Students . . . . . US$50 or £25
Libraries . . . . . US$100 or £50

Cheques or bank drafts should be drawn on a British bank, payable to the Afro-Asian Journal of Nematology, and addressed to Dr M R Siddiqi International Institute of Parasitology, St Albans, Herts, AL4 OXU, United Kingdom.

(Frances Reay, Waite Agricultural Research Institute, University of Adelaide, Glen Osmond, SA, Australia)

FIRST AFRO-ASIAN NEMATOLOGY SYMPOSIUM

The Afro-Asian Society of Nematologists announce the holding of their First Afro-Asian Nematology Symposium on 29 November - 6 December 1992 at the Aligarh Muslin University, Aligarh - 202002, Uttar Pradesh, India.

LOCATION

Aligarh is about 80 miles from Delhi and about 56 miles from Agra, the city of Taj Mahal. It lies on the Delhi-Kanpur-Calcutta main railway line.

LANGUAGE

English will be the official language of the symposium as well as of the papers to be presented.

REGISTRATION FEE

US$60.

CURRENCY

India uses decimal currency - 1 Rupee = 100 Paisa (singular Paisa), US$1 = 20 Rupees.

TEMPERATURE

Early December in Aligarh is moderately cold but normally sunny, with temperatures ranging between 5 and 20°C.

THEMES OF THE SYMPOSIUM

1. Teaching and Extension Nematology
2. Morphology and Taxonomy of Plant and Soil Nematodes
3. Integrated Pest Management
4. Resistance/Tolerance
5. Distribution, Hosts and Economic Nematology
6. Nematicides and Environmental Pollution
7. Plant Quarantine and Phytosanitary Regulations

SECTIONS OF THE SYMPOSIUM

1. Keynote speeches
2. Paper presentation sessions
3. Poster sessions
4. Colloquia

PROCEEDINGS

All presented papers will be published as Proceedings of the Symposium.

POST-SYMPOSIUM TOUR

A post-symposium tour in air-conditioned buses will be arranged from Aligarh to Agra-Jaipur (overnight stay), Delhi.

CONTACT

Professor A C Verma, Department of Nematology, ND University of Science and Technology, Kumarganj, Faizabad 224 229, India.

(Frances Reay, Waite Agricultural Research Institute, Glen Osmond, South Australia)

ONTA MEETING - CANARY ISLANDS

In the last week of April 1992, I attended the 24th Annual meeting of the Organisation of Nematologists of Tropical America (ONTA) on the island of Lanzarote, Canary Islands. The island has a rugged, treeless landscape because it was formed by recent volcanic activity and receives only about 75 mm of rain per year. Nevertheless, it has a productive agriculture, with grapevines, onions, potatoes and maize being grown without irrigation. The desert-like landscape can be farmed because the pumice-based 'soils' absorb moisture from the atmosphere so that 15 cm below the surface there is a permanent supply of moisture for plants. If I hadn't seen it, I would have found it hard to believe. Much of the work presented at the meeting was of interest to nematologists in Australia and New Zealand. Some of the highlights were:

1. Dr J Pinochet and his group from IRTA, Barcelona, Spain presented several papers on nematodes of pome and stonefruit. Their main interest is in rootstocks with resistance to *Meloidogyne*, and the pathogenicity of *Pratylenchus vulnus*.

2. Much of the work in South America is still dominated by the potato cyst nematodes. However, several workers reported on the widespread distribution and economic importance of the false root-knot nematode (*Naccobus aberrans*). Important hosts include *Beta*, *Brassica*, *Capsicum* and *Solanum*. Several physiological races have been differentiated.

3. David Viglierchio (ex U C Davis) presented a paper showing that the genus *Anguina* is able to transport a wide range of bacterial species into plant tissue. He therefore believes that nematode-bacterial relationships such as *Anguina tritici*/*Corynebacterium tritici* and *A. agrostis*/*C. rathayi* are non-specific in nature.

4. Dr J Kloepper, Auburn University, Alabama gave an overview of the work which is being done with plant-growth promoting rhizobacteria (PGPR) in both plant pathology and nematology. He suggested that PGPR improved plant growth through a number of mechanisms and was optimistic that they could play a role in nematode control.

5. As would be expected, there has been a marked shift away from work on chemical control. Most applied work was being done on resistance, but several papers were presented on biological control, trap cropping, rotation crops and organic amendments.

After the meeting, I visited Tenerife, the largest of the Canary Islands, and spoke at a symposium on integrated control of soil-borne pathogens. This island was quite different to Lanzarote and had tremendous variety in its agriculture. At sea level, avocado, mango and banana were grown whereas at higher elevations cool temperate crops such as apples and potatoes were common. The nematode problems on banana had been extensively researched and we saw several potato crops that had been damaged by potato cyst nematode.

For those wishing to attend a future ONTA meeting, they plan to meet in Bolivia in 1993, Honduras in 1994 and (tentatively) in Brazil in 1995. ONTA will be hosting the Third

International Nematology Congress in 1996 and have decided that it will be held in Guadulupe. I am a regional representative for ONTA and would be pleased to provide contacts for those requiring information on the Society.

(G R Stirling, Queensland Department of Primary Industries, Brisbane)

METHYL BROMIDE AND OZONE DEPLETION

I have just returned from a UNEP-sponsored meeting in Washington D.C. where I served on a panel which looked at ways of reducing emissions of methyl bromide (MBr) into the atmosphere. The following are a few notes on my assessment of the current situation with regard to MBr.

1. Under the Montreal Protocol on substances that deplete the ozone layer, there is a continuing assessment of all materials that could have such an effect. In 1991, a scientific panel identified MBr as a potentially significant contributor to ozone depletion. More recent studies have confirmed its importance and have concluded that anthropogenic (i.e., man-made sources) contribute a significant proportion of the MBr in the stratosphere.

2. In 1990, about 66 k tonnes of MBr was used throughout the world, of which most (51 k tonnes) was used in soil fumigation. The rest was used for post-harvest treatments, in structural fumigation and as a chemical intermediate in the chemical industry. Not only is soil fumigation the major user of MBr, but soil fumigation has largely been responsible for the growth in MBr consumption in recent years. Australia and New Zealand are relatively small users of MBr (about 1 k tonne) and about 75% is used in soil fumigation.

3. It is estimated that about half of the MBr used (i.e. 30 k tonnes) is emitted into the atmosphere. Soil fumigation is the major contributor, as it is the major use and approximately 50% escapes to the atmosphere.

4. The soil fumigation panel on which I served consisted of scientists with expertise in plant pathology, nematology, integrated pest management and chemical and non-chemical control of soil-borne pests and pathogens. It included people from a number of countries and representatives of the chemical industry. We concluded that it was technically possible to achieve a substantial reduction in MBr emissions through a combination of the following:

    - Improved application practices (e.g., deeper injection, better sealing, less permeable and longer tarping, strip and spot treatment (vs. full-field treatment), less frequent fumigation and reduced dosages.

    - Replacement with alternative chemicals (e.g., chloropicrin, methylisothiocyanate liberators, 1, 3D, non-volatile nematicides).

- Increased use of non-chemical methods of control (e.g., cultural controls, crop rotation, resistant cultivars, biological control, organic farming methods, solarisation).

It was recognised that it would be difficult to immediately eliminate MBr, and that the major problems with such a proposal would occur in agricultural systems that have developed to depend on MBr (e.g., strawberries in California) and in situations where it is used against pests which cannot be controlled by other means (e.g., oak root fungus).

5. Countries which are signatories to the Montreal protocol will be determining their position on MBr in the next few months. A decision on the fate of MBr will then be made by all parties at a meeting in Copenhagen in November 1992. Australia and New Zealand should have a particular interest in the outcome as we are relatively close to the 'ozone hole' which now occurs over the Antarctic each year.

6. My personal assessment of the situation is that we will be required to make quite drastic reductions in the use of MBr in the next few years and that the chemical is likely to be phased from use by the year 2000. If it is retained, it is likely to be kept for the commodity and structural fumigation areas, where use is relatively small, where there are few effective alternatives and where technical developments should make it possible to recover most of the MBr that is used.

(G R Stirling, Queensland Department of Primary Industries, Brisbane)

PLANT NEMATOLOGY WORKSHOP - SUCCESSFUL

Graham Stirling and Julie Stanton conducted a three day workshop from Friday 10 July to Sunday 12 July on the applied aspects of plant nematology at Gatton College, University of Queensland. Approximately 30 people attended, including several AAN members, representatives from the Agro-Chemical industry, researchers and technical staff. Topics covered included basic morphology and ecology of nematodes, methods of sampling, extraction and counting, identification of common genera and species, diagnosis of diseases caused by nematodes, major nematode problems of field and horticultural crops and nematode control. Sessions alternated between lectures and practicals, so there was plenty of opportunity for "hands on" nematology. The consensus seemed to be that the exercise was well run and a valuable opportunity to improve the group's nematological knowledge.

Several of the delegates took the opportunity to share their experiences well into the small hours of the morning and rumour has it, even broke into song.

Thanks to Graham and Julie for a very well run workshop.

(Russell Eastwood, Victorian Institute for Dryland Agriculture, Horsham, Victoria)

BOOK REVIEW

M S Jairajpuri and W Ahmad 1992. Dorylaimida: free-living, predacious and plant-parasitic nematodes. E J Brill, Leiden. XV + 458 p (originally published in India on 2 January 1992 by Oxford and IBH Publishing Co., Pty. Ltd., New Delhi, marketed exclusively by E J Brill outside India) - US$81.

As the first comprehensive coverage of the dorylaims for almost 30 years, this volume is a welcome addition to nematological literature. An initial 53 pages outline the morphology of dorylaims. The balance of the book is a systematic listing of dorylaims to species level using the following higher categories:

Order - Dorylaimida
- Suborder - Dorylaimina
  - Superfamily - Dorylaimoidea
    - Families - Dorylaimidae, Aporcelaimidae, Quadsianematidae, Nordiidea
  - Superfamily - Actinolaimoidea
    - Families - Actinolaimidae, Trachypleurosidae, Carcharolaimidae
  - Superfamily - Longidoroidea
    - Families - Longidoridae, Xiphinematidae
  - Superfamily - Belondiroidea
    - Family - Belondiridae
  - Superfamily - Tylencholaimoidea
    - Families - Tylencholaimidae, Leptonchidae, Mydonomidae, Aulolaimoididae
- Suborder - Nygolaimina
  - Superfamily - Nygolaimoidea
    - Families - Nygolaimidae, Nygellidae, Aetholaimidae, Nygolaimellidae
- Suborder - Campydorina
  - Superfamily - Campydoroidea
    - Family - Campydoridae

Order - Triplonchida
- Suborder - Diptherophorina
  - Superfamily - Diphtherophoroidea
    - Family - Diptherophoridae
  - Superfamily - Trichodoroidea
    - Family - Trichodoridae

A section "Recent Additions" includes genera and species from 1987-90.

Unlike Siddiqi's (1986) volume on Tylenchida, the higher classification used by Jairajpuri and Ahmad is unlikely to cause controversy. However, I feel that the authors have failed to address problems. Since 1967, there has been debate as to whether the belondirids form a "natural" group but on page 247 after a chronology of proposals, the authors say "since the superfamily Belondiroidea has been accepted by several other authors, we have tentatively retained it here". For many of the genera of Dorylaimida listed (and thus presumably accepted as valid) there are remarks as to the opinions of previous authors but no firm statement by the present authors of their opinion. At the species level, Australasian readers will note that no comment is made on the possible synonymy of *Paratrichodorus christiei* (Allen 1957) with *P. minor* (Colbran, 1956).

Despite the subtitle "free-living, predacious and plant-parasitic nematodes" both the morphological and systematic parts of the book are silent on feeding habits and biology of the nematodes. Unfortunately, in the light of work on some *Ziphinema* and *Longidorus*, even the statement "like other nematodes, the dorylaims have four juveniles stages . . ." (page 16) is dated and requires qualification.

Usage is the best way to detect errors and omissions. However, in skimming through the volume, I noted confusion over the year which *Amphorostoma* was proposed and then synonymised with *Proleptonchus*, and the second species of *Falcihasta* proposed in 1973 is not mentioned. One block of 8 references contains two "obvious" errors. Overall, the book is well presented, with clear illustrations of each genus, and free from obvious typographic errors.

When I began nematology in 1966, I had the advantage of J B Goodey's 1963 volume. Both future students and experienced nematologists are indebted to the authors for bringing together 458 pages of information on a group which covered only 101 pages in 1963. Their new work "Dorylaimida: free-living, predacious and plant-parasitic nematodes" provides a basis for future critical work on this group of large nematodes which play an important role in soil processes.

(Gregor Yeates, Landcare Research, Lower Hutt, New Zealand)