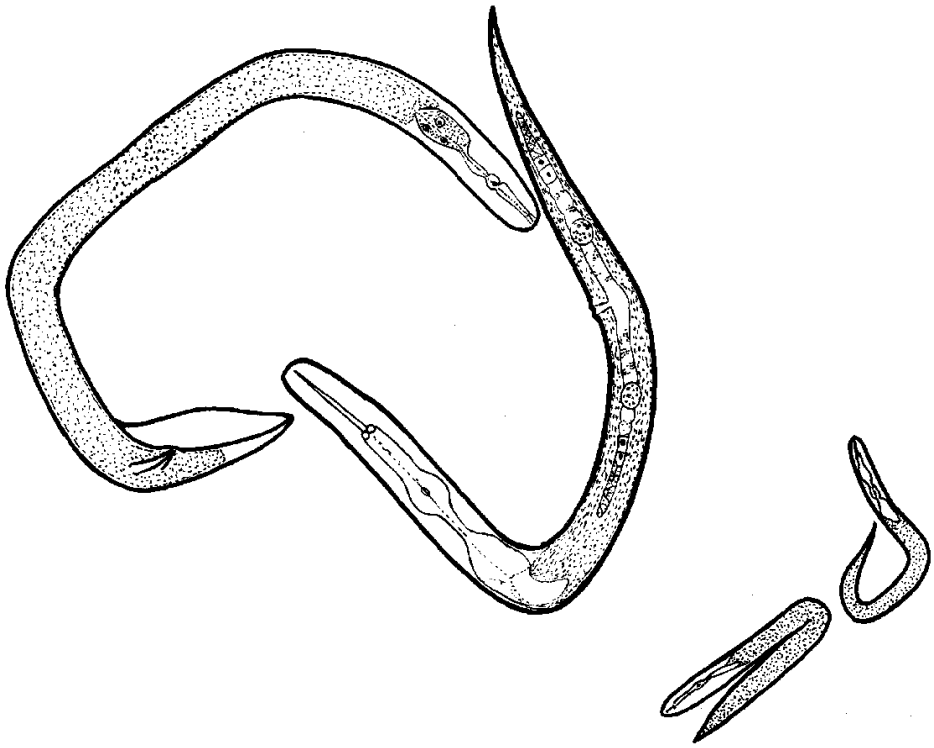
ISSN 1327-2101

AUSTRALASIAN NEMATOLOGY NEWSLETTER



Published by: **Australasian Association of Nematologists**

VOLUME 22 NO. 2 **JULY 2011**

From the Editor

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

We had a bumper issue in January; but this one is very slim. Despite two appeals for contributions, very few have come in. We are all busy; but we all have news to share. I look forward to many contributions in December.

Juanuary Issue

The deadline for the January issue will be mid December 2011. I will notify you a month in advance so please have your material ready then.

Kerrie Davies

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Association News

FROM THE PRESIDENT

One of the best things about being in AAN is the biennial general meeting. This year it was passed in very convivial company and surroundings at the end of the Darwin wharf. This is always a good opportunity to find out who has been finding what around the place. It was particularly interesting this year in that "the place" included our northern and northeastern neighbours as well. The AAN is the Australasian Association, and we should remember that there are many nematological stories going on outside the border of Australia and NZ, where most of our members come from. I would like to thank the people who came from China, Indonesia, Fiji and Mexico for sharing their insights with us. I am sure that this will help biosecurity in the region and in making sure we avoid sharing all the same nematological problems, as well. I don't think we are in danger of running out of nematode problems, just running out of nematologists.

Earlier we had a workshop where I was interested to see some fantastic nematode damage on okra, and hear about how nematodes can wipe out production of some crops with only a small change in management the apparent cause. Many years ago, I recall driving into Darwin from Kakadu, and picking up lovely melons from roadside stalls for only a dollar or so. That (admittedly small) industry has largely gone thanks to nematodes, so we should never forget how damaging nematodes can be.

I hope this page will stand in lieu of a formal President's report from the annual meeting. I have tried to discuss all the same issues in print, so that everyone can contribute if they wish. If we are going to have an informal society, then this should be one of the benefits.

In this vein, I should formally thank Sarah (Secretary), Vivien (Treasurer), Kerrie (Newsletter editor), and Ian (Webmaster) for their continued support of the AAN.

There are a multitude of nematology meetings, and I have expressed previously concerns about the number of potential meetings. Coming up are the International Nematology Conference (ESN) meeting in Turkey in 2012, the annual SoN meeting in 2012, the ASDS in Freemantle in September 2012, the ICPP (International Congress of Plant Pathology) in Beijing in August 2013, APPS in Auckland in November 2013, another annual SoN meeting in 2013 and finally the 6th International Congress of Nematology in South Africa in 2014. We have just finished the APPS and SoN meetings this year. This issue was raised at the general meeting, with the only resolution to leave the "official" AAN meetings associated with APPS as currently (except for ICN years when we are expected to have just one meeting coinciding with the ICN). If this is the preferred solution, then members should start planning soon to get to APPS, so that we can see as many members as possible there. As I hope Brisbane proved, it is both very rewarding to have many nematologists together, and is good to show that there is still nematological expertise in Australasia. In an era of increasing demand to work in large teams, having at least informal contacts with other nematologists is probably more important than ever.

Do not forget that we have a fund to support student attendance at these sorts of meetings.

On the international front, the process of deciding the status of the International Federation of Nematology Societies (IFNS) continues. The consultation of the IFNS President with the societies was inconclusive, with many expressing support for the concept of formally incorporating IFNS, but raising concerns about the additional administrative and financial

burden this will place on IFNS. As reported previously, this informal status causes problems if IFNS wants to do anything involving money or contracts. Exploration of the issue continues with the IFNS President Frida Decraemer exploring more options. One of the biggest stumbling blocks is that an incorporated society has to be based somewhere, and that city has to have someone in it to carry out aforesaid administration. Once constituted, this city is difficult to change, especially across jurisdictions or countries. The way funding is at the moment, few cities in the world can be guaranteed to maintain a nematological presence, and one willing to administer the IFNS among other tasks. At the moment the USDA in Washington DC or a European Centre like Wageningen look possibilities. In the interim, things will probably continue as they have in the past, which does beg the question of whether we need this change at all.

The next "Nematodes in cropping systems: identification & techniques" course is on in Adelaide in late November (see flier at the end of this newsletter). Please spread the word to anyone who might be interested.

Mike Hodda

Regional News

NEWS FROM SOUTH AUSTRALIA

The University of Adelaide

Lisnawita (Ita), a nematologist from North Sumatra University, Medan, Indonesia, left Adelaide in mid-February after 3 months in Kerrie Davies' lab. She and Kerrie made a couple of road trips, to the Grampians in Victoria and Yorke Peninsula, in search of *Fergusobia* galls, and Ita described a new species from *Eucalyptus tereticornis*. The wet summer seems to have been good for fergusobiid galls, which have been more plentiful than for some years.

After many attempts, Kerrie has finally re-collected *F. tumifaciens*, the type species for the genus *Fergusobia*, from Jindera near Albury. She has re-described it, and is just waiting for some molecular data before submitting the manuscript. Kerrie has also been in the Cairns region, where fergusobiid galls were few, but she was able to re-collect two interesting new species of *Schistonchus* from fig fruits.

'Fred' Bartholomaeus has completed her year of part-time work on *Fergusobia* (funded by ABRS); and (no doubt with relief) will be returning to work on *Schistonchus* (also funded by ABRS).

Katherine Linsell has submitted her PhD thesis on genetic and physiological characterisation of resistance to *Pratylenchus thornei* in wheat. The abstract of her thesis is included in this issue.

Kerrie Davies

Ian Riley (as an affiliate of the School of Agriculture Food and Wine) spent 6 months in China, returning in February. He was based at Henan Agricultural University in Zhengzhou and worked with Prof. Li Honglian. The group has a large number of research students working on nematology projects, with a particular focus on cereal cyst nematode.

Not feeling constrained by matters nematological, most of Ian's time was spent developing a web-assisted writing course inspired by Cargill M, O'Connor P (2009) 'Writing Scientific Research Articles: Strategy and Steps' (Wiley-Blackwell: Chichester, UK). The abstract of a report on this work given at the Crawford Fund "China-SARDI-CIMMYT Plant Pathology Symposium" held at the Waite Campus on 2 May 2011 follows.

"Impact analysis of training in soil-borne pathogens conducted in China with Crawford Fund support indicated gains in research activity and funding. However, publishing in the international literature was identified as an area needing further attention.

PublishBiology.net was developed as a new approach to training and support in publishing in English. Publish Biology is a web-based resource made available to members (trainees) before, during and after facilitated training sessions. The website has training modules, examples, exercises and a wide range of resources, and was designed to encourage ongoing contact with members through regular updates, a question/answer page and by highlighting member's successes in publication. The course was delivered in Baoding (Hebei), Xiamen (Fujian) and twice in Zhengzhou (Henan) in 2010/11, as well as provided retrospectively to members of two classes conducted in Turkey in 2009. Publish Biology has over 70 members and consideration is being given to how effectively to use the resource in future training."

Given the positive feedback from the course members, Ian is keen to see this resource used and to deliver further training classes. One or two courses are being planned for his next visit to China in October. If you see other opportunities for such training he would be pleased to discuss the possibilities.

Ian Riley

NEWS FROM WESTERN AUSTRALIA

Murdoch University

Nematode diagnostics

Mathew Tan, supported by a studentship from the CRC for National Plant Biosecurity, is continuing his work on studying new approaches for diagnostics of plant parasitic nematodes. His project includes identification of cyst and roo lesion nematodes using mass spectrometry – protein profiling by MALDI-TOF mass spectrometry can be used to identify these nematodes at genus and species levels. He has also undertaken 2D protein separation, and identified protein spots on gels that appear to be species-specific. Some of these spots have been analysed further by MS-MS to identify them. This information could be used to develop end-user 'lateral flow' diagnostic tests, based on species specific antibodies. Matthew is also looking at a new way of identifying root lesion nematodes which avoids having to develop specific antibodies – we will let you know how this progresses next year! Mathew is co-supervised by Vivien Vanstone at DAFWA, and has had close contact with Jenny Cobon in Queensland amongst others.

Transgenic sugarcane

The group at Murdoch has developed a series of lines of sugarcane which exhibit good resistance to the root lesion nematode, *Pratylenchus zeae*. This work is currently supported by a grant from the Australia-India Strategic Research Fund (AISRF), in collaboration with Dr Uma Rao at the Indian Institute for Agricultural Research.

Transgenic wheat

The group at Murdoch has also developed lines of transgenic wheat with increased resistance to *Pratylenchus thornei*, based on glasshouse tests.

Nematode genomics

As part of the above ongoing projects, we have also undertaken next generation sequencing (NGS) of three nematode transcriptomes: *P. thornei*, *P. zeae* and *Heterodera schachtii*. It looks like root lesion nematodes have relatively small genomes, and not surprisingly they do not encode any of the putative parasitism genes found in *Meloidogyne incognita*, for

example. Cell wall degrading enzymes are similar to those of bacteria, indicating probable acquisition from bacteria by horizontal gene transfer. NGS generates a huge amount of data; much of this is still being analysed. A paper on the transcriptome of *P. thornei*, describing about 7,000 transcripts of which 42% have been annotated, was given at the recent COST Action 872 meeting in Belgium. Mike has been the only Australian member of COST Action 872 (Nematode Genomics), and has attended all the meetings for this Action. This has lead to joint funding applications with leading nematology labs in Europe, so fingers crossed for the outcomes of these applications!

Arabidopsis

H. schachtii (BCN) is endemic to the Swan Coastal Plain, and can be found in almost every field where Brassicas and beet are grown. The group at Murdoch has also been studying the *H. schachtii-Arabidopsis thaliana* model system, to study basic aspects of this host-pathogen system, with a view to its control.



Collecting BCN, Arabidopsis plants in the glasshouse to be analysed, counting nematodes in the lab.

Two new Endeavour Studentships

We are pleased to welcome two new PhD students who have been awarded prestigious national Endeavour PhD Studentships – Harshini Herath from Sri Lanka, and Sadia Iqbal from Pakistan. They are just settling in at the moment, and will be working on new approaches to developing host resistance to cyst and root-knot nematodes.

Members of the group:

Postdoctoral researchers: John Fosu-Nyarko, Vaughan Agrez, Reetinder Gill;
RA: Jamie Ong, Meenu Singh;
PhD students: Joanne Tan, Mathew Tan, Paul Nicol, Harshini Herath, Sadia Iqbal;
Honours student: Shu Hui;

Group Leader: Mike Jones
Staff who have left in the last year: Motiul Quader, Doug Chamberlain, Susan Philip.

Collaborators: Vivien Vanstone, DAFWA; John Lewis, SARDI; Peter Waterhouse, University of Sydney, Uma Rao IARI (India); John Jones, Scottish Crops Research Institute; Godlieve Gheysen, Ghent; Derek Goto, Hokkaido University, Japan; Rosane Curtis, Rothamsted Research, UK.

You may be interested in the book from the COST 872 Action which is hot off the press: 'Genomics and Molecular Genetics of Plant Nematode Interactions', Eds John Jones, Godlieve Gheysen and Carmen Fenoll, Springer, (2011), especially Chapter 4: Jones, M G K and Goto, D B, Root-Knot Nematodes and Giant Cells, pp 83-100!

Mike Jones

Thesis Abstract

CHARACTERISATION OF RESISTANCE TO *PRATYLENCHUS THORNEI* IN WHEAT

Katherine Linsell

School of Agriculture Food & Wine, The University of Adelaide

Summary of thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy, 2011.

Root lesion nematodes of the genus *Pratylenchus* feed and reproduce in the root cortex of many plant species, including wheat. Migration through root tissue causes extensive root damage, and in turn severe reductions in growth and yield. In Australia, one of the most prevalent and widespread species affecting wheat is *Pratylenchus thornei*. Due to the wide host range of *Pratylenchus* spp. and the restrictions and inefficiency of chemical pesticides, the development of resistant cultivars has become increasingly important. Despite the identification and investigation of several resistance sources and resistance quantitative trait loci (QTL), no *P. thornei* resistance has been integrated into commercial cultivars.

The identification of novel sources of genetic resistance and understanding of their biological mechanisms will allow effective combinations of genes either to be used alternatively or pyramided to generate effective and stable *Pratylenchus* resistance. The major objectives of the project were to identify genetic loci associated with *P. thornei* resistance and to investigate the associated biological resistance in the Sokoll x Krichauff wheat population.

Prior to this study, the biological resistance mechanisms of wheat against *P. thornei* were not well characterised. The nature and timing of nematode development observed can be used as a guide in future studies. The root invasion process by *Pratylenchus* can be separated into four main components: root recognition and attraction, penetration, endoparasitic feeding and reproduction. Each of these stages was analysed to determine in which stage/s resistance occurred, and its form. Attraction and penetration assays were conducted on seedlings grown both in sand and on agar.

There was no significant difference in the rate at which *P. thornei* was attracted towards resistant or susceptible roots in sand. However on agar, when both genotypes were present, there was a significantly higher attraction towards the susceptible roots. This suggests that resistant roots may secrete repellent or toxic compounds during pre-penetration or that susceptible roots secrete more attractants. The penetration rates of *P. thornei* in resistant and susceptible roots, both on agar and in sand, did not significantly differ. No preferred root penetration zone was observed with *P. thornei*, but penetration was not random as nematodes were attracted to root regions previously invaded. In concordance with other *Pratylenchus* studies, resistance to *P. thornei* in this Sokoll x Krichauff population acts post penetration.

Analysis of *P. thornei* development in the resistant and susceptible genotypes showed that significantly fewer *P. thornei* nematodes of all stages occurred in the resistant compared to the susceptible roots. Juvenile development was suppressed as no second stage juvenile nematodes (J2) were present 35 days after inoculation in resistant genotypes. At 45 days after inoculation, forty times more *P. thornei* J3 were present in the susceptible than the resistant parent. Previously, resistance against other *Pratylenchus* species was expressed as nematodes exiting resistant roots. However, in this study, similar numbers of *P. thornei* J2's were still present within the resistant roots 10 days after inoculation, indicating that resistance suppresses nematode development rather than causing nematodes to leave resistant roots.

The suppression of juvenile development could occur as a result of suppressed nematode feeding and migration and/or reproduction. Simple and inexpensive assays were designed to investigate *P. thornei* motility, hatch and egg deposition in root exudates and roots grown on agar. Significantly higher numbers of *P. thornei* nematodes became non-motile when exposed to root exudates/extracts from resistant (65%) versus susceptible (30%) roots after exposure for 3 days. In migration assays, *P. thornei* only migrated a small distance through the resistant root cortex from the point of inoculation (10 mm), but further in the susceptible roots (70 mm). This suggests that resistance root compounds are present. The effects of these compounds were found to be reversible and to differentially affect *P. thornei* but not *P. neglectus*. The effective root exudates/suspensions were derived from seedlings not exposed to *Pratylenchus* or other plant pathogens, suggesting that resistant genotypes constitutively produce compounds that inhibit motility.

In addition, *P. thornei* reproduction was affected by resistant genotypes with suppressed egg deposition and hatch. Egg deposition was up to 30% less with the resistant lines at a rate of female egg deposition per day three times lower than in the susceptible lines. About 40% less hatch occurred from eggs within and adjacent to roots of resistant versus susceptible seedlings grown on agar. Similarly, hatching was decreased by about 10% in resistant root exudate compared to the susceptible after 10 days of exposure. An increased hatch after dilution of root exudates and a lower hatch in resistant exudates versus the absence of roots suggests the presence of hatching inhibitors.

In order to identify QTL and develop molecular markers accounting for the observed resistance, a genetic map was constructed in the doubled haploid population comprising 150 lines derived from a cross between the synthetically derived Sokoll and Australian adapted Krichauff parental lines. A total of 860 DArT markers and 111 microsatellite markers were used to assemble the genetic map. Two highly significant *P. thornei* resistance QTL were identified on chromosomes 2BS and 6DS, *QRlnt.sk-2B.1 and QRlnt.sk-6D*, explaining 24 and 43% of the phenotypic variation, respectively. These QTL mapped to chromosome regions previously identified as associated with *Pratylenchus* resistance, based on common marker locations. Two significant QTL were also identified on chromosomes 4A and 5A, explaining 6 and 9% of the phenotypic variation. The population was fixed for the effects of the highly significant QTL on 2BS and 6DS and further QTL were identified on chromosomes 2B, 2D, 3A, 5B and 6B.

Due to the considerable costs and labour associated with *Pratylenchus* phenotypic screening methods, molecular markers employed through marker assisted selection will accelerate the development and thus availability of resistant cultivars. The linkage of the microsatellite marker locus *barc183* to *QRlnt.sk-6D* is also associated with *P. thornei* resistance found in other mapping studies in different genetic backgrounds. This highlights the potential benefit of this marker for use in marker assisted selection.

The ultimate aim of this project was to correlate a biological role with an identified *P. thornei* resistance QTL. Thus, in order to identify whether the QTL linked to *P. thornei* were associated with the observed motility and hatch inhibition, a subset of the population was phenotyped using the designed motility and hatch assays. Suggestive QTL were identified on chromosomes 2B, 5B, 6B and 6D linked to hatching and motility suppression, which co-located to the *P. thornei* resistance QTL identified in this and previous studies. Although only suggestive, the alignment with other QTL suggests that these resistance QTL may play a role in inhibiting *P. thornei* motility or juvenile hatching.

The biochemical characteristics of the resistant root compounds causing suppressed *P. thornei* motility and hatch were investigated. Root exudates that were subjected to heat/cold treatments caused less suppression of motility compared to the untreated control. Reverse phase chromatography revealed that motility suppression was greatest in crushed root fractions that were eluted with the lowest ethanol concentrations, suggesting these resistant root compounds are water soluble and polar.

The results of this study show that the resistance to *P. thornei* observed in the Sokoll x Krichauff wheat population is complex and under the control of two highly significant and several minor loci, which do not affect penetration but suppress nematode feeding, development and reproduction.

Obituary

HARRY WALLACE

H. R. (Harry) Wallace was born on 12 September 1924 in Lancashire, England. During WWII, he served in the merchant navy. He subsequently trained as a zoologist and then studied wood-boring beetles for his PhD, which he received from the University of Liverpool. In 1952, he joined the School of Agriculture at the University of Cambridge and began working on nematodes, studying seasonal emergence and the effects of soil structure, particularly aeration, on hatching in *Heterodera schachtii*. While at Cambridge, Harry Wallace's discussions with Sir James Gray, Professor of Zoology, led to his work on locomotion in nematodes, which commenced soon after he moved to Rothamsted Experimental Station in 1955. However, Wallace also continued to investigate the effects of environmental factors on hatching of nematode eggs and infectivity of larvae, including attraction to roots, particularly in *Heterodera* spp. and *Ditylenchus dipsaci*. For some of these studies, he worked collaboratively with Audrey Shepherd and J. J. Hesling. In 1960, he was awarded a DSc from the University of Liverpool.

In 1962, Professor W. R. (Buddy) Rogers visited Rothamsted and encouraged Harry Wallace to move to Australia. He arrived at the then new CSIRO Division of Horticulture in Adelaide in 1963, where Alan Bird was already employed. There he concentrated his efforts on *Meloidogyne javanica*, and continued his work on environmental factors affecting movement of infective juveniles, also studying the development, hatching and survival of eggs. He became interested in factors affecting reproduction of *M. javanica*, and the effects of the nematode on its hosts. Seymour Van Gundy (University of California, Riverside) spent a sabbatical with Harry Wallace and Alan Bird in 1966, and collaborated with them on a study of ageing and starvation in larvae of *M. javanica* and *Tylenchulus semipenetrans*.

In 1971, Harry Wallace was appointed to the Chair of Plant Pathology at the Waite Agricultural Research Institute, The University of Adelaide. While this meant making contributions to undergraduate teaching and an increased administrative load (and hence less personal time for research), it also meant that he had PhD students and that he could broaden his research interests. He continued his work on root-knot nematode and its effects on photosynthesis and nutrient demand in host plants. One major study, with Brian Stynes, involved the use of a synoptic approach to assess the relative importance of various environmental factors on the growth and yield of plants. With Frances Reay, he investigated the susceptibility to and effects of *M. javanica* on various native plants and the biodiversity of nematodes in the Australian bush; with Greg Walker and Joe Kimpinski he examined interactions between nematodes, environmental factors and host plants; and with Gordon Grandison and Anthony Smith he investigated the distribution and abundance of *Pratylenchus* and *Helicotylenchus*.

Harry Wallace's (1965) review paper was important in crystallising ideas about the direction to be taken for research on *H. avenae* (CCN). It set out the issues to be resolved before growers could be provided with 'recommendations based on scientific facts relevant to Australian conditions'. The 10 key research topics he listed were: (1) the distribution of the nematode in Australia, especially in areas outside South Australia and Victoria, (2) an estimate of losses in yields, (3) the influence of environmental conditions on survival, dormancy, hatching, infection and population increase in relation to the Australian climate, (4) the factors in different soil types affecting distribution and abundance, (5) the taxonomic status of Australian populations of *H. avenae* and whether different races exist, (6) host preferences of different populations and races, (7) changes in population density with season, soil type and crop locality, (8) the relationship between crop damage and nematode population density under different environmental conditions, (9) the testing of wheat varieties for resistance to the nematode, and (10) the use of nematicides in badly infested areas. It is a tribute to Harry Wallace's insight that, within two years of arriving in Australia and having no experience with CCN, he was able to present such an astute plan of action. All of his suggestions were acted upon and CCN is now managed through a combination of resistant and tolerant varieties and crop rotation. He gave practical support to Alan Dube's (South Australian Dept. of Agriculture, later SARDI) group, providing space in the Hannaford building (aka the departmental Field Laboratory). Without this support, Dube's group could not have developed as it did, delivering significant contributions to SA and Australian agriculture through work on CCN, *Anguina* and later *Pratylenchus*

One of Professor Wallace's great strengths was his ability to write with clarity and enthusiasm. He was able to integrate, effectively summarise, critically examine and review large amounts of information. His first book, 'The Biology of Plant Parasitic Nematodes' (Wallace 1963) was based on his studies on cyst nematodes in England during the 1950s, and examined the effects of factors such as soil structure, soil moisture, temperature and aeration on egg hatch and nematode motility. As he mentioned in the preface to his second book (Wallace 1973), his ideas on many aspects of plant nematology gradually evolved as he came to recognise the ecological complexity of cropping systems. Since nematodes were only one of many factors contributing to plant disease, his later papers considered the effects of nematode/environment interactions on the reproduction of *M. javanica* and on the growth of the host plant (Wallace 1969b, 1970, 1971). From these studies he concluded that, in a given ecological situation, nematode numbers and environmental factors affected nematode reproduction but host tolerance and numerous environmental stresses influenced the response of the plant to nematode attack. This theme was expanded in 'Nematode Ecology and Disease' (Wallace 1973), which should remain required reading for any student of plant nematology. Professor Wallace outlined the various ways that nematodes caused damage to plants, considered the way plants responded to nematode infection and discussed the environmental factors that influence both nematodes and their hosts. He pointed out that disease problems in the field were complex, that nematodes were only one of many factors (both biotic and abiotic) contributing to the problem and suggested that a multidisciplinary approach was needed when diagnosing diseases and developing strategies to reduce losses caused by a disease. Later papers with Brian Stynes provide a detailed example of the use of such an approach to determine the relative importance of various environmental factors on the growth and yield of wheat in South Australia (Stynes *et al*. 1979, 1981).

Professor Wallace was a particularly able administrator. On most days, his desk was cleared by lunch time, and the door to his office was then opened – a signal to everyone that he was available for advice and discussions. In this way, he helped and influenced countless people, including undergraduate and postgraduate students and academics. Even Tom Playford, former Premier of South Australia, dropped in to discuss disease problems in his cherry orchard. Harry Wallace was a kind, gracious, thoughtful, and caring man, of great tolerance. This, together with his enthusiasm and insight, meant that he was much loved. His students included Sariah Meon, Joe Kimpinski, Greg Walker, Jackie Nobbs and Brian Stynes, and with John Fisher he co-supervised a number of students working on CCN. In 1975, Professor Wallace was made a Fellow of the Australian Academy of Science.

After his retirement, Harry Wallace busied himself with environmental matters, particularly dealing with the Coorong region of South Australia and its management. He died in July 2011, aged 86 years.

Selected publications

Wallace HR (1963) 'The biology of plant parasitic nematodes.' (Edward Arnold: London)

Wallace HR (1965) The ecology and control of the cereal root nematode. *Journal of the Australian Institute of Agricultural Science* 31, 178--186.

Wallace HR (1966) The influence of moisture stress on the development, hatch and survival of eggs of *Meloidogyne javanica*. *Nematologica* 12, 57--69.

Wallace HR (1968) The influence of aeration on survival and hatch of *Meloidogyne javanica*. *Nematologica* 14, 223--230.

Wallace HR(1969a) The influence of non-ionic detergent on the movement of *Meloidogyne javanica*. *Nematologica* 15, 107--114.

Wallace HR (1969b) The influence of nematode numbers and of soil particle size, nutrients and temperature on the reproduction of *Meloidogyne javanica*. *Nematologica* 15, 55--64.

Wallace HR (1970) Some factors influencing nematode reproduction and the growth of tomatoes infected with *Meloidogyne javanica*. *Nematologica* 16, 387--397.

Wallace HR (1971) The influence of density of nematode populations in plants. *Nematologica* 17, 154--166.

Wallace HR (1973) 'Nematode ecology and plant disease.' (Edward Arnold: New York)

Kerrie Davies and Graham Stirling

Other News

SHORT COURSE

NEMATODES IN CROPPING SYSTEMS - IDENTIFICATION AND TECHNIQUES

The next course is scheduled for Adelaide from 28 November to 2 December 2011. If you are interested, please submit a non-binding expression of interest to Mike Hodda at CSIRO Ecosystem Sciences or Kerrie Davies at The University of Adelaide (addresses below).

As in previous presentations of this course, Kerrie Davies and Mike Hodda, the co-convenors, will try to tailor the course to suit the needs of participants. We envisage the following.

The workshop will suit researchers and professionals working in agriculture, quarantine, green keeping, and soil biology, who need to understand the principles and practice of handling soil, plant and insect nematodes. It will provide hands-on experience in sampling, extraction, specimen preparation, culturing, diagnosis, and identification (including molecular techniques). There will be opportunity for interaction with experts in the field.

Participants should have a degree which includes biology, agriculture, or soil science or have appropriate work experience to undertake the workshop. Less experienced participants can be supplied with recommended reading material prior to the workshop.

Nematodes to be considered include:

Meloidogyne Tylenchulus Heterodera Tylenchorhynchus

Pratylenchus Morulaimus Ditylenchus Radopholus

Anguina Bursaphelenchus Scutellonema Hemicycliophora

Paratrichodorus Filenchus Xiphinema Tylodorus

Aphelenchoides Heterorhabditis Helicotylenchus Steinernema

Rhabditida Mononchida Dorylaimida Areolaimida

Anticipated course cost is $1760 (including GST). This includes all materials and a printed course manual. Payment is due by 30 September 2011.

Details of course content can be varied to suit the interests of the participants. Please contact the co-ordinators to discuss any specific needs or topics desired for inclusion.

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