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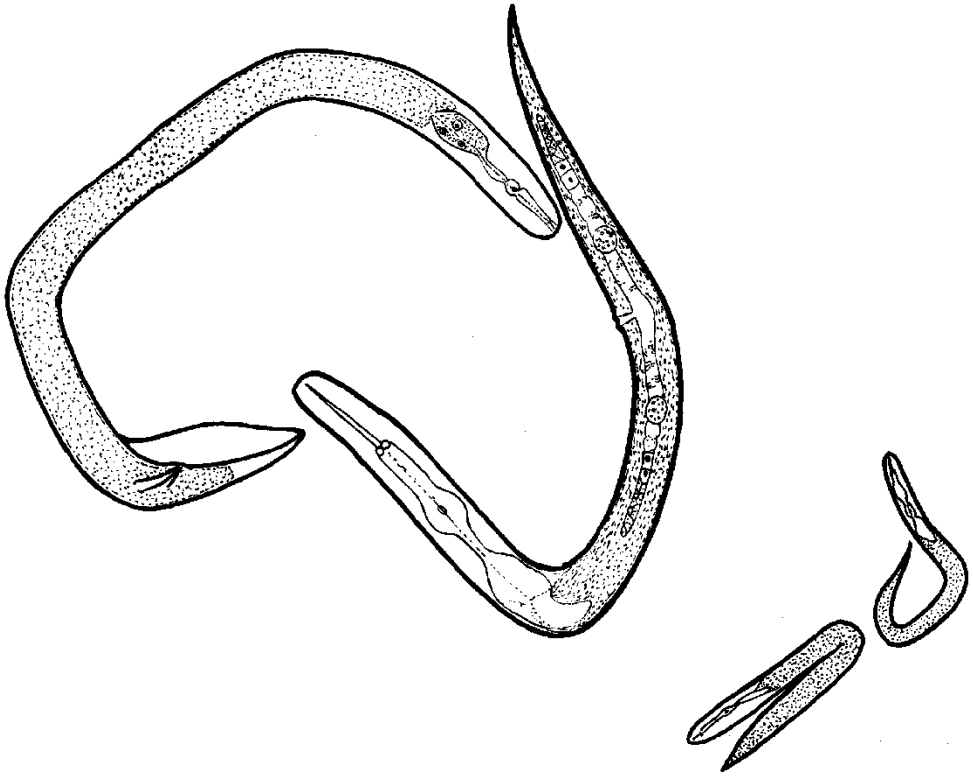
AUSTRALASIAN NEMATOLOGY NEWSLETTER



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From the Editor

Thank you to the regular contributors for sharing your latest news and research outcomes in this issue of the Newsletter. If you have never submitted an article to the Australasian Nematology Newsletter I encourage you to consider providing a short item of news or article on research results to the next issue.

Articles on regional news, recent publications, announcements of new research projects, colleagues, visitors, students etc., research reports, conference or workshop reports, abstracts of recently submitted/accepted PhD theses, conference or workshop announcements and photos are welcome. Contributions will be accepted at any time throughout the year so please forward articles and reports to me as they occur, with the deadline for the next issue around June 2019.

I look forward to receiving your contributions for future issues and keeping you up to date with the regional news of our AAN members.

Rebecca Zwart

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Association News

FROM THE PRESIDENT

A short note this time written from the Lao PDR, with hopefully useful information on what you need to know, and no commentary.

The 7th International Congress of Nematology is on from May 3 to 8, 2020 with the theme of "Crossing borders: a world of nematode diversity and impact to discover". Check out the very professional web site https://www.alphavisa.com/icn/2020/index.php . The programme is just about finished but there are still chances to organize a special session on your favourite nematological topic if you want to. Contact me as the AAN representative to the organizing committee.

If you are a student and a member of AAN, and you would like assistance to attend the ICN or any other worthwhile nematological event in Australia or elsewhere, remember that the Australian Nematology Support Fund offers substantial sponsorship. The application procedure is as simple as sending a few paragraphs of who you are and why you want to go. I cannot recall anyone being knocked back, although I'm not sure everyone received everything they wanted: the fund can seldom give full funding. Again contact me with any queries.

The call for expressions of interest in attending the 11th (?) Nematodes in Cropping Systems Workshop is included elsewhere in the newsletter. The tentative dates and venue are 2-6th December 2019 at The University of Adelaide. This year we have Dorota Porazinska from The University of Florida helping us out, and as a result, there will be more emphasis on molecular approaches. Guess you better contact me about this as well!

The database of marine nematode taxonomic names known as NeMYS or WORMS (World Register of Marine Species) has recently been expanded to cover aquatic and terrestrial nematodes. A separate section already covers helminth nematodes. There are few freshwater or terrestrial nematodes included at present, but if you are interested in contributing, please contact Tania Bezerra at the University of Gent (Tania.Bezerra@UGent.be).

If you think you love nematodes, have a look at this interview with Byron Adams about *Scottnema lindsayae*:
https://www.bing.com/videos/search?q=byron+adams+nematode&&view=detail&mid=13AC8E50792F13A9BEC013AC8E50792F13A9BEC0&&FORM=VDRVRV

Mike Hodda

FROM THE TREASURERS

Fees for the AAN (Australasian Association of Nematologists) are due annually 1st July through to 30th June. The $15 annual fee covers newsletter articles and information regarding nematology opportunities including specialised workshops.

If you are outstanding with your fees you will be contacted shortly for the previous year.

You can no longer pay through the APPS web site when registering your membership, all now come through the AAN bank account. We have had support for many years with APPS but they are no longer able to assist with this service due to logistics.

ONLY Payment Method

ANZ

Account Name: Australasian Association of Nematologists

BSB: 012-950

Account # 5180-07506

Looking forward to your continued support and the camaraderie the Nematology group brings.

Kind Regards

Katherine Linsell and Sue Pederick (Joint Treasurers AAN)

Regional News

NEWS FROM QUEENSLAND

University of Southern Queensland

In late November 2018 we farewelled Tim Clewett, who is using some long-service leave before settling into retirement. Tim has had a fantastic 41 year-long career in soil microbiology with the Queensland state government and more recently at The University of Southern Queensland. His co-authorship on numerous publications is a testament to his scientific acumen. In his farewell speech he highlighted his interactions with growers who had been devastated financially and emotionally by the impact of severe root-lesion nematode infestation or long-fallow disorder caused by lack of arbuscular mycorrhizal fungi (AMF). Being able to diagnose those problems and help growers and agronomists manage nematodes and AMF was very satisfying. Tim always had time for a chat, to share his vast knowledge or to help anyone. At the end of every smoko, his catch-phrase was "… time to get back to the research". We're going to miss Tim.

Tim Clewett's huge smile at his recent farewell says it all. (Photo credit: Jan Clewett).

The Crop Nematology team at University of Southern Queensland (USQ) has now moved from the Leslie Research Facility to the new Agricultural Science and Engineering precinct at the USQ Toowoomba campus. The new facilities, including four new glasshouses, are amazing and we are looking forward to working closely with the other teams in the Centre for Crop Health. The official opening of the centre is in early February. Our phone numbers and email addresses remain the same, but our postal address is now Centre for Crop Health, P22, University of Southern Queensland, Toowoomba, QLD, 4350. Our higher degree students in Crop Nematology are all hard at work with their research. They are preparing posters along with other Centre for Crop Health students for presentation of their research at the opening of the new facilities at USQ in February. Martin Fiske has joined our crop nematology team while Tim Clewett is on long-service leave. Martin worked with John Thompson on AMF and nematodes 14 years ago before a career in plant breeding.

The 2018 winter season was extremely dry and for the first time in many years, we were unable to plant any winter crop field experiments at our *P. thornei* or *P. neglectus* sites. Luckily summer rains have allowed us to plant a mungbean variety trial and a large area of the susceptible black gram cv. Regur (*Vigna mungo*) to build-up *P. thornei* populations for the 2019 winter season of planned experiments.

In July 2018, Kirsty Owen attended the Society of Nematologists (SON) meeting in Albuquerque, New Mexico followed by the International Congress of Plant Pathology (ICPP) in Boston. At the SON meeting, Kirsty presented her work on the effect of growing susceptible mungbean cultivars followed by wheat on changes in *P. thornei* population densities and the impact on crop production. At the ICPP, she presented a comparison of summer crops grown before wheat and the effect on changes in *P. thornei* population densities and yields. The SON meeting was a highlight - the breadth of nematology research and the enthusiasm for all things nematology was inspiring. The lobster in Boston was quite delicious too!

John Thompson and Jing Lin attended the 10th Australasian Soilborne Diseases conference in Adelaide in September. Jing attended the pre-conference workshop on PredictaB and John attended the workshop on Actinobacteria. At the ASDS they presented a poster on the production of germplasm for wheat breeding that has dual resistance to *Pratylenchus thornei* and *P. neglectus*. The workshops were excellent and the presentations at ASDS were up to the usual high standard across a range of topics with nematology well represented.

Publications:

Owen, K.J., Clewett, T.G., Bell, K.L., & Thompson, J.P. (2018) Lost opportunity: Mungbeans (*Vigna radiata*) in wheat cropping systems favour *Pratylenchus thornei*. Proceedings of Society of Nematologists, Conference (pp. 80-81), Albuquerque, New Mexico.

Owen, K.J., Clewett, T.G., Bell, K.L., & Thompson, J.P. (2018) Suppression of *Pratylenchus thornei* after sequences of resistant summer grain crops maximised production of an intolerant wheat cultivar. Paper presented at the International Congress of Plant Pathology, Nematode Control (IPM) Session, (p 48), Boston, U.S.A. https://apsnet.confex.com/apsnet/ICPP2018/meetingapp.cgi/Paper/9948

Sparks, A.H., & Thompson, J.P. (2018) Linear modelling of soil temperature effects on root-lesion nematode population densities in R. *Open Plant Pathology Notes.* Retrieved from https://www.openplantpathology.org/notes/sparks/1/

Thompson, J.P., Rostad, H.E., Macdonald, B., & Whish, J.P.M. (2018) Elevated temperature reduces survival of peak populations of root-lesion nematodes (*Pratylenchus thornei*) after wheat growth in a vertisol. *Biology and Fertility of Soil, 54*, 243–257. https://doi.org/10.1007/s00374-017-1256-3

Thompson. J.P., Sheedy, J.G., Robinson, N.A., Lin, J., Reen, R.A., & Clewett, T.G. (2018) Development of wheat cultivars with combined resistance and tolerance to *Pratylenchus thornei* and resistance to *P. neglectus* for the Australian grains industry. In V.V.S.R. Gupta, S. Barnett and S Kroker (Eds), *Paddock to plates: Proceedings of the 10th Australasian Soilborne Diseases Symposium*, (pp. 147-148) Adelaide, Australia.

Kirsty Owen

NEWS FROM VICTORIA

Horsham

This year has been another relatively busy year in Victoria with some staff changes. Dr Joshua Fanning accepted a new role in pulse pathology and Jon Baker has stepped up from his technical role to take on the nematology program. Jon has been a technician in the nematology program for two years and is well placed to take on the role. In his two years he has already completed nematology training with Mike and Kerrie, and statistical training, while also learning the field program. To replace Jon, we welcome Dr Winnie Liu Heang, who has previously worked at the CCDM, but has had a few years off whilst moving her family to Horsham. Winnie brings a wealth of new expertise and molecular skills and we look forward to what roles she will take on in the future.

This year the group published four years' worth of *Pratylenchus thornei* and *P. neglectus* resistance data in cereals in collaboration with SARDI and The University of Adelaide. This paper also highlighted the high correlations between the resistance ranking of varieties across different locations in Victoria and South Australia. Jon and Josh presented posters at the Australasian Soilborne Diseases Symposium and Grant chaired a session. Jon presented preliminary results on *P. thornei* population densities over a season and into the following year, finding that they did not necessarily correspond to plant growth but were more related to temperature. Josh's poster was results on the prevalence of soilborne pathogens in Victoria with *Fusarium spp.*, *P. neglectus*, and *Rhizoctonia solani* detected at the highest levels, with the highest risk to the Wimmera and Mallee districts. Interestingly, in the Wimmera and Mallee districts, 71-85% of paddocks had two or more pathogens present and 15-25% at the medium to high PREDICTA B® risk categories. The references are listed below.

The field program has reduced in size this year with two GRDC funded projects, the National Nematology and Yield Response, coming to an end in 2019. Grant has been working very hard on preparing refunding documents around these projects. The National Nematology project resulted in updates to fact sheets on both root-lesion and cereal cyst nematodes; large amounts of data collection on yield losses across pulse, oilseed and cereal crops; an economic report on yield losses associated with root-lesion nematodes; revision of the PREDICTA B® risk categories and several training events and field tours held across the country. We look forward to what is next in nematode research.

Publications:

Fanning, J., Linsell, K., McKay, A., Gogel, B., Munoz Santa, I., Davey, R., & Hollaway, G. (2018) Resistance to the root lesion nematodes *Pratylenchus thornei* and *P. neglectus* in cereals: Improved assessments in the field. *Applied Soil Ecology, 132*, 146-154. https://doi.org/10.1016/j.apsoil.2018.08.023

Baker, J. M., Fanning, J. P., & Hollaway, G. J. (2018) Population dynamics of the root lesion nematode *Pratylenchus thornei* on wheat in southern Australia. In V.V.S.R. Gupta, S. Barnett and S Kroker (Eds), *Paddock to plates: Proceedings of the 10th Australasian Soilborne Diseases Symposium*, (pp. 167-168) Adelaide, Australia.

Fanning, J.P., Baker, J.M., McKay, A.C., & Hollaway, G.J. (2018) Prevalence of soil-borne pathogens in Victorian cereal growing districts, In V.V.S.R. Gupta, S. Barnett and S Kroker (Eds), *Paddock to plates: Proceedings of the 10th Australasian Soilborne Diseases Symposium*, (pp. 163-164) Adelaide, Australia.

Joshua Fanning.

NEWS FROM WESTERN AUSTRALIA

Murdoch University, SABC

This year we have been busy with four PhD completions in the plant nematology from the Plant Biotechnology Research Group, based in the WA State Agricultural Biotechnology Centre this year:

Farhana Begum: Biology and molecular characterisation of the root lesion nematode *Pratylenchus curvicauda*. Supervisors: Prof Michael G. K. Jones and Dr John Fosu-Nyarko.

Fareeha Naz: Improving the effectiveness and delivery of gene silencing triggers to control plant parasitic nematodes. Supervisors: Dr John Fosu-Nyarko and Prof Michael G. K. Jones.

Sameer Khot: Silencing parasitism effectors of the root lesion nematode, *Pratylenchus thornei*. Supervisors: Prof Michael G. K. Jones, Dr John Fosu-Nyarko and Dr David Berryman.

Sharmin Rhaman: Neuronal signalling molecules as targets for green peach aphid (*Myzus persicae*) control via RNA interference. Supervisors: Dr John Fosu-Nyarko and Prof Michael G. K. Jones.

Recent graduates in plant nematology from Murdoch University.

There are various publications in the pipeline from their work. We would like to thank various members of the AAN community for helping examine some of these theses – we need two Australian and one international reviewer in each case (or sometimes two international), which took time as we didn't want to overload any one potential examiner!

Current PhD students include Jebin Akther, who attended the ESN meeting in Brussels and gave a talk on 'Stability and heritability of RNAi in generations of transgenic plants and nematodes', Maria Maqsood who is studying effectors which may be common in nematodes and aphids, and Jyoti Rana, who is studying effectors of root-lesion nematodes.

Honours completions:

Rhys Copeland: Identification and characterisation of putative parasitism genes of the root-lesion nematode *Pratylenchus neglectus*.

Alex George: Magnetofection of tobacco protoplasts: a novel mechanism for plant transformation.

Dr John Fosu-Nyarko is now Chief Scientist for a new wheat biotech company (Green Blueprint Pty Ltd) which will also tackle nematode issues of cereals, and which purchased the previous company (Nemgenix Pty Ltd). The latter focussed only on nematode R&D, and supported many of the PhD students who have

completed in the last 10 years. It's how we funded most of the basic R&D in plant-nematode interactions without GRDC or HIA support over this period! As a result we have some potential Intellectual Property which has slowed submission of some publications.

Prof Mike Jones has been busy on a number of fronts, including:

- Submissions to the WA State Government (joint with Ausbiotech) on ' Response to Inquiry into mechanisms for compensation for economic loss to farmers in Western Australia caused by contamination by genetically modified (GM) material'
- Membership of the Ausbiotech national committee on AgTech&Food
- Member of the Agricultural Biotechnology Council of Australia (ABCA)
- Co-ordinating new teaching Unit on 'Agricultural and Environmental Technologies' in Murdoch University's 'Crop & Pasture Sciences Degree'
- Reviewing agriculture in Mauritius at the request of the Ministry of Agro-Industry and Food Security (AIFS), and the development of the Mauritius Biotechnology Institute – this included meetings with the Minister of AIFS and the Prime Minister, interviewing staff of the AIFS and the University or Mauritius
- Keynote Speaker 3rd International Congress on Biotechnology and Bioengineering, 23-26 June 2018, Kuala Lumpur, Malaysia
- AusAg & Food Tech Summit, Melbourne, Sept 3-4, 2018.
- Pastoralists and Graziers Association meeting WA, invited to present prize on behalf of CropLife Australia, Sept 27, 2018
- Establishing the Murdoch University 'Centre for Crop and Food innovation' – the academic case has been passed by Senate, just waiting for the budget to be accepted by the Vice-Chancellor.

Recent relevant publications:

Iqbal, S. & Jones, MGK (2017). Nematodes. In B. Thomas, D. Murphy & B. Murray (Eds.), *Encyclopedia of Applied Plant Sciences* (2nd ed., pp. 113-119). Oxford: Elsevier, Academic Press. https://doi.org/10.1016/B978-0-12-394807-6.00061-7.

Harikrishna, J.A., Othman, R.Y., Mispan, M.S., Iqbal, S., Han, Y. & Jones, M.G.K. (2019) Mini review: Biosafety of RNA silencing and genome editing technologies in crop plants: Malaysian and Australian research perspectives. *Asia Pacific Journal of Molecular Biology & Biotechnology* (in press)

Smiley, R.W., Dababat, A., Iqbal. S., Jones, M.G.K., Maafi, Z.T., Peng, D., Subbotin, S. & Waeyenberge, L. (2017) Cereal Cyst Nematodes: A Complex and Destructive Group of Heterodera Species. *Plant Disease, 101,* 1692-1720. https://doi.org/10.1094/PDIS-03-17-0355-FE

Jones, M.G.K. (2017). New strategies to control nematode and aphid pests of grain crops. *GRDC Grains Research Updates 2017*, 4 pp, refereed article.

Jones, M.G.K. (2017). New Breeding Technologies: Potential for crop improvement and Current Regulatory Status. *GRDC Grains Research Updates 2017*, 4 pp, refereed article.

Fosu-Nyarko. J., Iqbal, S. & Jones, M.G.K. (2017). Chapter 10: Targeting Nematode Genes by RNA Silencing. In T. Dalmay (Ed.), *Plant gene silencing: Mechanisms and Applications* (pp. 176-192). CABI Publishing.

Mike Jones

Research Report

DPIRD NEMATOLOGY RESEARCH UPDATE: ARE WEEDS COMMONLY FOUND IN WESTERN AUSTRALIA'S BROADACRE CROPPING AREA SUSCEPTIBLE TO ROOT LESION NEMATOE PRATYLENCHUS QUASITEREOIDES? A PILOT TRIAL

Carla Wilkinson, Sarah Collins, Sean Kelly and Helen Hunter

Introduction

Root lesion nematodes, particularly *Pratylenchus neglectus* and *P. quasitereoides,* are prevalent in Western Australia's (WA's) broadacre cropping areas. They cause significant yield losses to WA's most commonly grown broadacre crops; wheat, barley, oats and canola. Although visible symptoms for these two nematode pests are the same these RLN species impact crops differently. Research has shown that common weed species associated with broadacre cropping in Australia vary in their level of susceptibility to *P. neglectus* (Vanstone et al, 2001i, Vanstone et al, 2001ii) but the reaction of *P. quasitereoides* has not been investigated. Susceptibility refers to the ability of the nematodes to multiply in a crop or crop variety. Increased 'weediness' is a common feature of paddocks suffering from the impacts of RLN infestation. Therefore, it is important to determine the susceptibility of common weed species to the RLN's present so that growers can gauge the importance of weed management in RLN infested paddocks. This experiment is a pilot trial conducted in a farmer paddock with the aim to compare the resistance of common weeds with Mace wheat, which is rated as moderately resistant to moderately susceptible (MRMS) to *P. quasitereoides*.

Methods

This pilot trial was conducted in a Mace wheat crop near Beverley, Western Australia. The paddock was being utilised for DPIRD RLN resistance trials and was infested with RLN (10 *P. quasitereoides*/g soil) at the commencement of the growing season. The soil type is considered an 'ironstone gravel' soil characterised as a predominately sandy matrix over a less permeable layer of either loam, clay or reticulite (mottled sandy loam or clay loam) with underlying compaction (https://www.agric.wa.gov.au/mycrop/mysoil). Six mature plants from each of the four common weed species present (Rye grass, barley grass, spear grass and wild oats) were randomly collected from one plot measuring 10 m x 1.54 m. Six mature wheat plants (Mace) were also collected to use as a positive control (*P. quasitereoides* rating MRMS). Each weed or wheat plant was considered as a replicate; so the experiment consisted of 5 treatments x 6 replicates. The sampling was conducted in early October 2017, prior to crop senescence.

For each plant sampled; roots were collected, bagged separately, and transported to the laboratory in a large esky to keep cool. The roots were washed free of dirt and cut into approximately 1 cm lengths, then mixed thoroughly for nematode extraction using the DPIRD mister system for approximately 96 hours. *Pratylenchus* species present were identified and counted using a compound microscope.

Results and discussion

Every root system tested was infested with *P. quasitereoides* and the average number present in the roots of all weeds were higher than wheat variety Mace (Figure 1). Wild oats had the highest level of RLN present in the roots, followed by Spear grass and Barley grass. Rye grass roots had the lowest number of *P. quasitereoides* for the weeds measured (Figure 1). Only wild oats had a significantly ($p>0.05$) higher number of *P. quasitereoides* than Mace wheat.

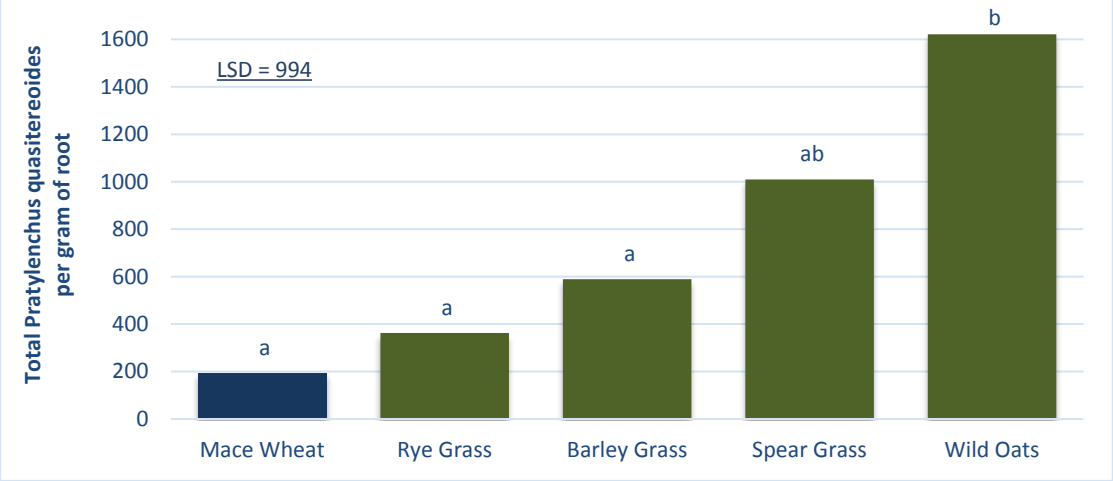

*Figure 1. Total number of root lesion nematode** P. quasitereoides *per gram of root (average) in four weed species and Mace wheat in spring 2017. Letters denote a significant difference, p>0.05 (note*a small number of P. neglectus were present in 6/30 samples)*

This paddock was considered to have a medium risk of yield loss in a susceptible wheat crop at the commencement of the season according to current PredictaB risk categories (http://pir.sa.gov.au). *P. quasitereoides* multiplication over the season in Mace plots in two adjacent field experiments; an oat variety and a wheat and barley variety tolerance trial was 0.9 and 0.8 respectively, which represented the lowest multiplication rate across all varieties in both trials and was consistent with its current resistance rating of moderately susceptible to moderately resistant (MRMS). A rating of MRMS means that *P. quasitereoides* populations are likely to increase over a season conducive to its lifecycle but numbers should decrease in a less conducive season. In this pilot trial, the amount of *P. quasitereoides* in the roots of the weeds in spring was higher than Mace. This suggests that *P. quasitereoides* is able to penetrate and carry out its lifecycle in all of these species. It also indicates that these weeds have the ability to maintain or increase this RLN species. This is particularly relevant to wild oats, where RLN numbers were significantly higher than mace wheat. This pilot trial indicates that growers with *P. quasitereoides* infested paddocks should consider weed levels in RLN management strategies. Further experiments are necessary to develop representative ratings for weeds that commonly grow in WA.

References:

Vanstone VA, Russ MH, 2001. Ability of weeds to host the root lesion nematodes *Pratylenchus neglectus* and *P. thornei*. I. Grass weeds. *Australasian Plant Pathology* **30**, 245-50.

Vanstone VA, Russ MH, 2001. Ability of weeds to host the root lesion nematodes *Pratylenchus neglectus* and *P. thornei*. II. Broad-leaf weeds. *Australasian Plant Pathology* **30**, 251-8.

Abstract

PROFITABLE BREAK CROPS FOR MANAGEMENT OF ROOT LESION NEMATODES (RLN) AND *RHIZOCTONIA SOLANI* AG8

Bec Swift, Alice Butler, Sarah Collins, Carla Wilkinson, Sean Kelly, Daniel Hüberli, Jeremy Lemon, Paul Mattingly*, Department of Primary Industries and Regional Development (DPIRD),* ***Garren Knell****, ConsultAg*

Key messages

- Legumes such as field pea, lupin, serradella and subclover offer break crop options for paddocks infested with root lesion nematode species (RLN) commonly found in Western Australia, *Pratylenchus neglectus* and *P. quasitereoides*.
- Where *Rhizoctonia solani* AG8 coexists in a paddock with RLN, lupin and subclover did not increase inoculum numbers in the soil as much as other crop options tested, including barley and wheat.
- Canola, wheat and barley crops greatly increased RLN numbers during the season.

Aims

The aim of these trials was to investigate the most effective and cost efficient break crops in a rotation with cereals (wheat) to manage root lesion nematodes (RLN) and *Rhizoctonia solani* (AG8) in the same paddock with damaging levels of both. This paper presents the results from two field experiments in paddocks infested with RLN and *R. solani*. The sites are in Grass Valley and Dumbleyung, where these soilborne disease and nematode issues are common. The trials were conducted in the 2018 broadacre cropping season and included cereals, canola, lupin, field pea, serradella and subclover.

Results

At harvest, all the legumes grown reduced numbers of the root lesion nematodes at Grass Valley and Dumbleyung sites, with the exception of subclover (Dalkieth) for *P. neglectus* at Grass Valley. At this site, the subclover reduced *P. quasitereoides,* the most prevalent RLN species in the paddock, by 80% at harvest, reducing the total RLN numbers. All cereals and canola increased the RLN, in most cases pushing the levels into the next yield loss risk category (McKay et al. 2018). At the Dumbleyung site, the canola doubled the number of *P. neglectus* in the soil, pushing levels from medium to the high risk category. Calingiri wheat increased RLN numbers by a drastic 350% but out yielded Mace, which increased RLN numbers by 150%.

All crops multiplied the *R. solani* AG8 inoculum in the soil at the Grass Valley trial. However, subclover and lupins had significantly lower multiplication rate compared to all crops including barley and wheat.

Conclusion

Overall, the legumes used in these trials significantly reduced numbers of the two major RLN present in WA in one season. Subclover and lupin also may provide a break for *R. solani*, but this needs further investigation. In 2019, the sites will be oversown with wheat to determine the profitability of each break crop in a cereal rotation.

Reference: McKay et al (2018) *Broadacre Soilborne Disease Manual V. 1.01*. SARDI, South Australia.

(Reproduced from GRDC Grains Research Updates 2019. Perth, Western Australia: Grains Industry Association of Western Australia.)

Abstract

TEN YEARS OF DIFFERENT CROP ROTATIONS IN A NO-TILLAGE SYSTEM – WHAT HAPPENED TO PLANT DISEASES AND NEMATODE PESTS?

Ken Flower[1,4], Daniel Hüberli[2], Sarah Collins[2], Geoff Thomas[2], Phil Ward[3], Neil Cordingley[4], *[1]UWA, [2]DPIRD, [3]CSIRO, [4]WANTFA*

Key messages

- Windrow burning had little effect on level of stubble-borne disease
- *Fusarium* spp. and *Rhizoctonia solani* levels increased in cereal dominated rotations
- *Pythium* spp. and *Pratylenchus neglectus* were favoured by more diverse rotations
- Farmers require up-to-date information on the host status of crops if rotation is going to be an effective broad-based control measure

Aim

To study the long-term effects of crop rotation and residue level on the main stubble-borne foliar and root diseases and nematodes in Western Australian no-tillage systems

Results

The research compared wheat monoculture with a cereal rotation (cereal/cereal/cereal), a diverse crop rotation (cereal/legume/canola), a 'typical' farmer rotation (cereal/cereal/legume or fallow) and a pasture.

Fusarium spp. and *R. solani* were favoured by the cereal-dominated sequences. *Fusarium spp*. DNA in the soil increased most in the cereal rotation and wheat monoculture, it hardly changed in the farmer rotation and pasture and it declined in the diverse rotation.

In contrast, root lesion nematode, *P. neglectus*, was favoured by the more diverse rotations (which had greater inclusion of nematode susceptible species). Levels of *P. neglectus* increased most in the pasture and diverse rotation, followed by the wheat monoculture and decreased in the farmer and cereal rotations. Soil *Pythium* spp. levels decreased significantly in the cereal and farmer rotations and the wheat monoculture and increased in the diverse rotation and pasture.

As expected, there were higher levels of yellow leaf spot when wheat was grown on wheat stubble. The farmer rotation and diverse rotation had the lowest levels of yellow leaf spot. Field pea blackspot was lowest in the cereal rotation and wheat monoculture. Overall, windrow burning had little effect on the level of leaf, root or crown diseases in cereals.

Conclusion

The various crop rotations affected soil nematodes and pathogen levels differently. The combination of canola and wheat, along with susceptible chickpea, appeared to favour root lesion nematode. In contrast, fallow and lupin in the farmer rotation appeared most effective at reducing nematode levels for the following season. The relatively high nematode numbers in the pasture was likely due to continuous presence of a number of susceptible weeds and subterranean clover. The crop selections in the diverse rotation of this experiment have generally been a poor choice in terms of their susceptibility to *P. neglectus*, our main nematode threat.

There were higher levels of *Pythium* spp. in the pasture and diverse rotation, because susceptible plants like legumes and canola were grown. *Pythium* spp. levels were lowest in the cereals.

R. solani was significantly greater in the soil following cereals compared with canola, chickpea and fallow. Nonetheless, the break crops appeared to have only had a relatively short term effect on levels of *R. solani*.

These differences in disease and nematode susceptibility between crop types and even varieties means that farmers require up-to-date information on the host status if rotation is going to be an effective broad-based control measure. Windrow burning does not appear to be effective as a long-term control option for the stubble-borne diseases.

(Reproduced from GRDC Grains Research Updates 2019. Perth, Western Australia: Grains Industry Association of Western Australia.)

Short Course 2019

NEMATODES IN CROPPING SYSTEMS: IDENTIFICATION & TECHNIQUES 2019

This document is to give information on the course currently scheduled for:

University of Adelaide, 2nd to 6th December 2019.

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

The presenters will be:

Dr Mike Hodda, CSIRO
Dr Kerrie Davies, University of Adelaide
Dr Dorota Porazinska, University of Florida

The cost of the course is AUD2000 (excluding GST) or AUD2200 (including GST).

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

The workshop requires 9 participants to proceed. Please send expressions of interest as soon as possible, and definitely before the end of September 2019.

For further enquiries or to book a place, please email the course coordinator: mike.hodda@csiro.au

Once confirmed, payment details will be forwarded. Payment can be by Credit card or invoice, but will be required prior to the course commencement.

No particular accommodation is suggested or recommended, but there are a number of hotels of various standards available nearby. A list will be sent closer to the course.

Why Nematodes?

Nematodes are the most numerous multi-celled organisms on earth. Soil nematodes are of great importance to cropping systems: they can significantly reduce plant yields; they are biocontrol agents of invertebrate pests; and they recycle soil nutrients. Recent work suggests that they have potential as bio-indicators of soil health. They are frequently encountered in quarantine work.

Specialised knowledge is required to handle and identify nematodes. This course provides the skills and information needed to confidently handle nematodes in a wide variety of situations. It includes sampling, collecting and preparing nematodes for identification, using keys and other tools for identification, as well as the background information needed to deal with nematodes. For the first time, molecular methods will be covered in some detail.

Is this Course for you?

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

Course Location

This course is being held in Adelaide, close to the southern grain region, grape-growing areas, and vegetable production. Nematodes from other crops and places in Australia, New Zealand and elsewhere will be treated during the course, but through fixed material. There are direct flights to Adelaide from most Australian capital cities.

Course Presenters

The workshop will be conducted by:

Dr. Mike Hodda (National Research Collections Australia & Biosecurity Flagship, CSIRO, Canberra),

Dr. Kerrie Davies (School of Agriculture, Food & Wine, The University of Adelaide), and

Dr. Dorota Porazinska (Institute of Food & Agricultural Sciences, University of Florida).

The presenters have almost 100 years experience researching nematodes between them, have described numerous species, have research experience in the entire field from pure science to practical applications. They have many years teaching experience to both graduates and undergraduates, and together have studied most taxonomic groups of nematodes over much of the Australia-Asia-Pacific Region, the USA, Europe and Africa.

Course Content

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

Nematodes to be Considered

Anguina ..... Seed & Leaf Gall Nematodes
Aphelenchoides..... Bud, Leaf & Foliar Nematodes
Bursaphelenchus..... Pine Wood Nematode
Ditylenchus..... Stem & Bulb Nematodes
Globodera..... Potato Cyst Nematodes
Helicotylenchus ..... Spiral Nematodes
Hemicycliophora ..... Sheath Nematodes
Heterodera..... Cyst Nematodes
Heterorhabditis..... Insect Biocontrol Nematodes
Meloidogyne ..... Root Knot Nematodes
Morulaimus..... Australian Sting Nematodes

Paratrichodorus ..... Stubby-Root Nematode
Pratylenchus ..... Root Lesion Nematodes
Radopholus ..... Burrowing Nematodes
Scutellonema ..... Spiral Nematodes
Steinernema ..... Insect Biocontrol Nematodes
Tylenchorhynchus ..... Stunt Nematodes
Tylenchulus ..... Citrus Nematode
Tylodorus .....
Xiphinema ..... Dagger Nematodes
Tylenchida ..... Minor Plant Parasites
Rhabditida ..... Microbial-Feeding Nematodes
Mononchida ..... Predatory Nematodes
Dorylaimida ..... Omnivorous Nematodes
Areolaimida ..... Omnivorous Nematodes

Actual list depends on participants interests.

Course Delivery & Materials

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

Course Fees

The workshop fee will be $2000 (AUD, excl GST where applicable). The fee is payable after notification that a minimum number of participants has been met. On acceptance registration, an invoice will be sent, which can be paid by credit card, or many other means (Money Order, cheque payable to "CSIRO, Nematode Identification" (ABN 41687119230), direct transfer or BPAY). The fee covers participation, the handbook and the provision of consumables such as fixatives, slides, and culture media. Tea and coffee and a course mixer will also be provided. Travel costs, accommodation, and meals are not included in the fee. The workshop requires 9 participants to proceed.

Accommodation/Meals

A variety of food outlets are available around the venue. Please indicate on the form if you require details from the workshop co-ordinator. Participants should make their own accommodation arrangements. The coordinators can supply lists of potential accommodations, with both low-cost student accommodation at the University and hotels of various standards nearby.

For more information

Dr Mike Hodda mike.hodda@csiro.au ph (02) 6246 4371
Dr Kerrie Davies Kerrie.davies@adelaide.edu.au

Helpful information for the organizers

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

University or other Tertiary Education: institution, degree, subjects with approx. dates?

Experience in nematology?

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

Other queries or preferences?

1. Monday 2 December

0900	Lecture	Introduction to course, housekeeping What is a nematode and what is not a nematode? (MH)
1000	Lecture	Nematodes and their basic anatomy (KD)
1100	Morning tea	
1130	Lecture	Nematode physiology and implications for quarantine, survival (KD)
1230	lunch	
1330	Practical	Sampling plant and insect nematodes from a variety of situations on campus (agricultural & native), set up some extractions (KD + MH + DP)
1500	Afternoon tea	
1530		Continue practical
1700	Finish	

2. Tuesday 3 December

0900	Lecture	Nematode ecology: distribution(MH)
1000	morning tea	
1030	Practical	Complete extraction of nematodes from samples taken Monday using other methods if required, viewing, counting (MH + KD + DP)
1230	Lunch	
1330	Lecture	Nematode ecology: trophic and other groupings (MH)
1430	Practical	Identification of major trophic types of nematodes (MH)
1500	Afternoon tea	
1530		Continue practical (MH)
1700	Finish	

3. Wednesday 4 December

0900	Lecture	Sampling background and theory, sampling for different purposes, bait selection (MH)
1000	Morning tea	
1030	Lecture	Population dynamics (KD)
1130	Practical	Mounting and examination of nematodes (KD)
1300	Lunch	
1400	Lecture	Reproduction, hatching, life cycles, host ranges (KD)
1500	Practical	Preparation of nematodes for microscopic examination, fixing and mounting (MH + KD + SS) rapid methods, lactoglycerol, processing (KD)
1800	Finish	

4. Thursday 5 December

0900	Lecture	Phylogeny, evolution and systematics to order level (MH)
0930	Lecture	Nematode disinfestation (MH)
1000	Morning tea	
1030	Lecture	Nematode systematics and identification of species (MH)
1130	Practical	Identification of nematode species, characteristics of major pest species in Australia (Root Knot Nematode, Cyst Nematodes, Root-Lesion Nematode, Spiral Nematode, Dagger Nematode, Stunt Nematode, Pine Wilt Nematode, other entomophilics, and non-pathogenic species) (MH + KD + DP)
1230	Lunch	
1330	Practical	Self-paced examination of nematodes (MH + KD + DP)
1500	Lecture	Species in plant-parasitic nematodes: the genus *Pratylenchus*, *Radopholus* & *Aphelenchoides* (Root Lesion, Burrowing & Leaf Nematodes) (MH)
1530	Lecture	Species in an Entomophilic nematode: the *Schistonchus* group (Fig Wasp Nematodes) (KD)
16000	Lecture	Molecular species identification (DP + MH)
1900	Informal course dinner	Local restaurant

5. Friday 6 December

0900	Lecture	Major pest genera, soil-dwelling pests of plants (KD)
1000	Morning tea	
1030	Lecture	Movement and dispersal of nematodes, hygiene and quarantine (MH)
1100	Lecture	Major pest genera, insect associates and pests of aerial parts of plants (KD)
1200	Practical	Identification of unknowns, revision as necessary, specific topics requested by participants (MH + KD + SS)
1230	Lunch	
1330		Continue identification
1400	Practical	Identification of unknowns, revision as necessary, specific topics requested by participants (MH + KD)
1500	Lecture	Molecular identification of nematodes in mixtures (DP + MH)
1600	Practical	Self-paced examination of nematodes (MH + KD + SS)
1700	Course close, evaluation	Presentation of certificates
1730	Finish	

2019/2020 Nematology Conferences

22ND NEMATOLOGICAL SOCIETY OF SOUTHERN AFRICA SYMPOSIUM

Date:11-15th May 2019

Venue: Gooderson Kloppenheim Country Estate, Machadodorp, Mpumalanga, South Africa

Website: http://sanematodes.com/wp-content/uploads/2018/07/NSSA-22-First-Announcement-2019B.pdf

THE SOCIETY OF NEMATOLOGISTS (SON) ANNUAL MEETING 2019

Date: 7-10th July 2019

Venue: Raleigh, North Carolina, USA

Website: https://nematologists.org/meetings-events/son-annual-meeting/

ORGANIZATION OF NEMATOLOGISTS OF TROPICAL AMERICA (ONTA) 51ST ANNUAL MEETING

Date:21-25th July 2019

Venue: San José, Costa Rica

Website: https://www.onta2019.com/index_eng.html

7TH INTERNATIONAL CONGRESS OF NEMATOLOGY

Date: 3-8th May 2020

Venue: Antibes Juan-les-Pins, France

Website: https://www.alphavisa.com/icn/2020/index.php