



Intensive grower surveys

PW17001 Final report Appendix 4 Integrated pest management of nematodes in sweetpotato

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Intensive growers' survey of plant-parasitic nematodes in Australian sweetpotato production

Summary

At the beginning of the project in 2018, field surveys were conducted throughout the major cropping regions to gain an understanding of region-specific nematode species occurrences and identify any potential biosecurity issues. Over 85 survey samples were processed with plant-parasitic nematode identification and quantification being the focus. Free-living nematodes were also identified to give an overall indication of the soil's biological status.

Further sampling of selected growers' fields across the different growing regions took place in 2020, 2021, 2022 and in some cases 2023 to gain a better understanding of plant-parasitic nematode dynamics under the different management systems undertaken by the growers.

Intensive surveys of growers' fields have been undertaken in the three growing regions. Four sites in northern NSW, seven sites in Wide Bay and four sites in Central Qld have been resampled for the intensive grower surveys from 2018 - 2021. Growers participating in the intensive grower survey have been provided with the nematode identification results for all years of sampling for their consideration and so they can make comparisons.

In the Wide Bay region where root-knot nematodes (RKN) were the major nematode problem, many growers had no great spikes in nematode numbers, but some growers were able to reduce the numbers of RKN (RL03, RL04, RL06, RL09).

Three of four sites intensively surveyed in Central Qld, had no reduction in reniform nematode numbers with current practices, while RL13 saw an increase in RKN numbers. Reniform nematode was present in relatively high numbers at all blocks surveyed in Central Qld with only RL13 with having low numbers of reniform nematode.

Two growers in northern NSW were able to reduce root-knot nematode numbers (EC04, RL21). A new detection of *R. reniformis* during the intensive grower surveys of 2021 (RL21) in northern NSW extends the known geographic range of this nematode species previously known to occur only in Queensland from Bundaberg north. In the initial survey of this project, this species was found in southern Qld., then the most southerly distribution of this nematode species. It is vital that this nematode is not spread to other blocks.

Outcomes

New detection of *R. reniformis* during the intensive survey in northern NSW extends the known geographic range of this nematode species. Growers have a greater understanding of the plant-parasitic nematodes in fields and of the species causing the impacts to crop yield and damage. Individual growers have been informed of all nematode species in their blocks and changes over time. This survey provides growers with validation (or not) of their on-farm management practices to control plant-parasitic nematodes.

Introduction

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Intensive surveys of growers' fields were undertaken in the three growing regions. Four sites in northern NSW, seven sites in Wide Bay and four sites in Central Qld have been resampled for the intensive grower surveys from 2018 to 2023. Growers participating in the intensive grower survey have been provided with the nematode identification results for all years of sampling for their consideration and so they can make comparisons.

Materials and methods

General methods are described in detail in appendix 2.

Representative soil samples were taken from a block/field to a depth of 10-15 cm using a clean probe, corer or auger. Nematodes were extracted from the soil samples in a Whitehead tray over four days. Nematodes were retrieved on a 38 µm sieve and then examined under a compound microscope for identification and quantification of all plant-parasitic species.

The major plant-parasitic nematodes recovered were identified using light microscopy and morphological characteristic according to the Commonwealth Institute of Parasitology (1972-1977) descriptions.

Results and Discussion

A table of results showing numbers of the three most important plant-parasitic nematodes together with all other plant-parasitic nematodes identified in sweetpotato production appears at Table 1. Total free-living nematode numbers are included in the table as an indication of the biological status of the soils, with high numbers indicating more biologically active soil.

In the Wide Bay region where root-knot nematodes (RKN) were the major nematode problem, many growers had no great spikes in nematode numbers, but some growers were able to reduce the numbers of RKN (RL03, RL04, RL06, RL09).

Three of four sites intensively surveyed in Central QLD, had no reduction in reniform nematode numbers with current practices, while RL13 saw an increase in RKN numbers. Reniform nematode was present in relatively high numbers at all blocks surveyed in Central Qld with only RL13 with having low numbers of reniform nematode.

Two growers in northern NSW were able to reduce root-knot nematode numbers (EC04, RI21). A new detection of *R. reniformis* during the intensive grower surveys of 2021 (RL21) in northern NSW further extends the known geographic range of this nematode species previously known to occur only in Queensland from Bundaberg north. In the initial survey of this project, this species was found in southern Qld, which at that time was the most southerly distribution of this nematode species. It is vital that the spread of this nematode is restricted.

Table 1 Plant-parasitic nematodes in sweetpotato production from intensive growers' surveys conducted in 2018, 2020, 2021, 2022 and 2023.

Plant-parasitic nematodes/200 g DW soil														
Sample ID	Year	Region	Root-knot <i>Meloidogyne</i> spp.	Reniform <i>Rotylenchulus reniformis</i>	Lesion <i>Pratylenchus</i> sp.	Reniform <i>Rotylenchulus parvus</i>	Spiral <i>Helicotylenchus dihystera</i>	Spiral <i>Rotylenchus brevicaudatus</i>	Stubby <i>Paratrichodorus</i> sp.	Dagger <i>Xiphinema</i> sp.	Stunt <i>Tylenchorhynchus</i> sp.	Ring <i>Criconemella</i> sp.	Pin <i>Paratylenchus</i> sp.	Total Free-living Nematodes
RL02	2018	Wide Bay Qld	394	0	0	0	43	0	0	0	0	0	0	390
RL02	2020	Wide Bay Qld	63	0	240	260	4	0	0	0	0	0	0	4496
RL02	2021	Wide Bay Qld	3	0	8	1	4	0	0	0	0	0	0	2443
RL02	2022	Wide Bay Qld	0	0	11	5	0	0	3	0	0	0	0	698
RL02	2022	Wide Bay Qld	125	5	25	15	0	0	1	0	0	0	0	2257
RL03	2018	Wide Bay Qld	264	23	0	0	273	0	0	0	0	20	0	904
RL03	2020	Wide Bay Qld	592	0	0	0	0	0	0	0	0	6	0	3032
RL03	2021	Wide Bay Qld	3	0	1	0	31	0	0	0	0	0	0	1157
RL03	2021	Wide Bay Qld	0	0	88	7	13	0	10	0	0	0	0	3899
RL03	2022	Wide Bay Qld	0	5	0	1	0	25	0	0	0	6	0	2846
RL03	2022	Wide Bay Qld	0	0	1	0	0	6	0	0	0	0	0	1976
RL04	2018	Wide Bay Qld	453	0	0	0	0	603	0	0	0	5	0	254
RL04	2020	Wide Bay Qld	2133	0	0	0	0	612	0	0	0	0	0	225
RL04	2021	Wide Bay Qld	100	0	0	0	0	596	0	0	0	0	0	1182
RL04	2022	Wide Bay Qld	183	0	0	0	0	457	0	0	0	0	0	489
RL04	2022	Wide Bay Qld	0	0	0	3	0	1	0	0	0	0	0	605

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RL06	2018	Wide Bay Qld	0	35	68	0	54	0	82	0	8	22	0	549
RL06	2020	Wide Bay Qld	20	2	4	0	2	6	1	0	5	1	0	120
RL06	2021	Wide Bay Qld	1220	8135	0	0	0	0	0	0	0	0	0	794
RL06	2022	Wide Bay Qld	0	0	95	0	9	0	47	0	0	493	0	996
RL06	2022	Wide Bay Qld	0	0	0	0	0	0	0	0	0	0	0	10
RL09	2018	Wide Bay Qld	506	0	0	0	1611	0	0	0	0	0	0	413
RL09	2020	Wide Bay Qld	40	0	45	21	75	0	1	0	0	1	0	1351
RL09	2021	Wide Bay Qld	530	0	25	20	1035	0	15	0	0	0	0	1767
RL09	2022	Wide Bay Qld	102	98	68	0	386	0	22	0	0	0	0	980
RL09	2022	Wide Bay Qld	2	0	0	0	2	0	0	0	0	0	0	1486
RL35	2018	Wide Bay Qld	0	0	2	2	39	0	1	0	0	0	0	962
RL35	2020	Wide Bay Qld	0	0	1	1	1	0	0	0	3	0	0	437
RL35	2021	Wide Bay Qld	0	0	0	0	0	24	0	0	0	0	0	3939
RL35	2022	Wide Bay Qld	0	0	0	0	0	51	0	0	0	0	0	908
RL35	2022	Wide Bay Qld	0	0	0	0	112	0	0	0	0	0	0	496
RL39	2018	Wide Bay Qld	162	0	2	221	199	0	18	0	0	0	0	1197
RL39	2020	Wide Bay Qld	0	0	0	0	1	0	0	0	0	0	0	1084
RL39	2021	Wide Bay Qld	17	0	3	0	0	0	0	0	0	0	0	2374
RL39	2021	Wide Bay Qld	15	0	0	0	18	0	2	0	0	0	0	2431
RL39	2022	Wide Bay Qld	0	0	1	105	0	0	20	0	0	0	0	3855
RL39	2022	Wide Bay Qld	0	0	0	69	0	0	0	0	0	0	0	1361
EC01	2018	northern NSW	20	0	0	0	218	0	7	0	0	0	0	736
EC01	2020	northern NSW	157	0	0	13	5	25	2	0	0	0	0	4051
EC01	2021	northern NSW	28	0	0	0	24	131	11	0	0	1	0	3728

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EC01	2022	northern NSW	6	0	0	0	1	0	0	0	0	0	0	1464
EC01	2022	northern NSW	3	0	0	1	2	0	2	0	0	1	0	945
EC04	2018	northern NSW	1611	0	0	0	320	0	0	0	0	0	0	379
EC04	2020	northern NSW	388	0	0	0	59	7	0	0	0	0	0	1983
EC04	2021	northern NSW	57	0	0	0	127	0	5	0	0	0	0	2311
EC04	2022	northern NSW	33	0	0	0	83	0	0	0	0	0	0	2065
EC04	2022	northern NSW	126	0	0	0	198	0	2	0	0	0	0	1221
RL21	2018	northern NSW	14	0	0	0	163	0	0	0	0	0	0	515
RL21	2020	northern NSW	44	0	1	0	8	0	1	0	0	0	0	1562
RL21	2021	northern NSW	1848	365	0	0	146	12	0	0	0	12	0	1471
RL21	2022	northern NSW	0	0	0	0	24	0	1	0	0	0	0	549
RL24	2018	northern NSW	1	0	88	0	93	0	2	0	0	0	0	870
RL24	2021	northern NSW	0	0	0	0	11	0	0	0	0	0	0	431
RL24	2022	northern NSW	13	0	824	0	178	0	33	0	0	0	0	1319
RL24	2022	northern NSW	4	0	209	0	22	0	12	0	0	0	0	709
RL11	2018	Central Qld	0	15	25	0	11	24	0	0	0	0	0	308
RL11	2020	Central Qld	2	2156	4	0	0	1	0	0	0	0	0	1396
RL11	2021	Central Qld	0	1573	0	0	0	0	0	0	0	0	0	1633
RL11	2022	Central Qld	0	3091	0	0	0	152	0	0	0	0	0	93
RL11	2022	Central Qld	0	187	0	0	0	0	0	0	0	0	0	3085
RL11	2023	Central Qld	0	2058	0	0	0	0	0	0	0	0	0	1920
RL13	2018	Central Qld	587	0	5	0	0	0	5	0	0	31	0	914
RL13	2021	Central Qld	0	2	0	0	1	0	2	0	1	3	0	1839
RL13	2022	Central Qld	0	0	20	0	0	0	140	0	2	2	0	2293

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RL13	2022	Central Qld	43	5	1	0	0	0	6	0	0	1	0	1024
RL13	2023	Central Qld	2679	0	0	0	0	0	10	0	0	19	19	2024
RL15	2018	Central Qld	4	19	57	0	13	0	0	0	0	0	0	1129
RL15	2020	Central Qld	4	125	7	0	0	0	0	0	0	0	0	3285
RL15	2021	Central Qld	411	411	0	0	0	4	0	0	0	0	0	451
RL15	2022	Central Qld	0	20	6	0	19	0	0	0	0	0	0	2406
RL15	2022	Central Qld	0	121	0	0	0	0	2	0	0	26	0	1785
RL16	2018	Central Qld	6	799	0	0	123	0	0	0	0	0	0	870
RL16	2020	Central Qld	2	147	0	0	5	0	0	0	0	0	0	2564
RL16	2021	Central Qld	3	9	0	0	0	0	0	0	0	0	0	2825
RL16	2022	Central Qld	0	227	35	0	0	0	0	0	0	0	0	2137
RL16	2022	Central Qld	0	103	0	0	31	0	3	0	0	25	0	2248

Selected case studies

RL03 Wide Bay

Had reduced the RKN population to undetectable levels by 2022. Has been growing Jumbo sorghum during 2021 and 2020. This is an excellent non-host rotation crop for both *M. javanica* and *M. incognita*.

RL04 Wide Bay

RKN numbers peaked in 2020 but have been falling since then. Triticale which is a good host of RKN was planted in 2019 so that may have contributed to the high numbers thereafter. Bare fallow in 2021 and 2022 reduced numbers. Used Metham in 2022 and numbers of RKN are now at undetectable levels.

RL06 Wide Bay

Numbers of RKN and reniform nematode peaked dramatically after a crop of Orleans and Bellevue in 2021. Bare fallow, Jumbo sorghum after that crop in 2021 more sorghum in 2022 and numbers of RKN and reniform nematode then undetectable in early 2022. Metham applied and numbers still undetectable.

RL09 Wide Bay

RKN after Saia oat rotation, then fallow and numbers dropped, then followed by crop of Orleans, Beauregard and Eclipse. Numbers peaked again, then followed by fallow, another crop and then fallows. RKN down but reniform nematode detected. Metham in 2022, RKN very low and reniform nematode undetectable.

RL21 northern NSW

Low numbers of RKN in 2018 and 2020. Numbers of RKN and reniform nematode (first detection) peaked in 2021. Jumbo sorghum planted and a bare fallow followed by more Jumbo sorghum. Sweetpotato sampled mid-crop in 2022 and numbers of RKN and reniform nematode undetectable.

RL11 Central Qld

Reniform nematode numbers peaked in 2020 after pigs, Algerian Oats rotation, bare fallow and Nimitz. Bare fallow followed from Sept 2021- April 2022 when both RKN and reniform nematode were undetectable. Few pumpkins, Swan oats and weeds sampled in October and numbers of reniform nematode beginning to climb up again. Planted sweetpotatoes (Orleans and mixed) with Nimitz, harvested smooth spuds with no sign of nematode damage. Sampled in June 2022, still no RKN, but reniform nematode high again.

RL15 Central Qld

RKN and reniform nematode numbers peaked in 2021 after a sweetpotato crop of Bellevue. Planted forage sorghum which seems to have reduced RKN to undetectable levels, but reniform nematode numbers are creeping up again. Reniform nematode numbers are hard to reduce once it has been found in a field.



Image 1 Measurements and GPS coordinates were used to identify sampled areas within production blocks.



Image 2 Project staff collecting soil samples wearing disposable boot covers.