QUANTIFYING PULSE ROOT DISEASE YIELD LOSS IN SA

SAGIT

RESEARCH SUMMARY

SUA920

FAST FACTS

PROBLEM

South Australian growers do not have accurate data on yield losses caused by root disease in lentils.

PROJECT

A range of treatment options were tested in an effort to compare and quantify the yield benefit of root disease management tools.

PARTICIPANTS

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DATES

Start: 1 Jul 2020
Finish: 30 Jun 2021

Field trials with faba bean, lentil, chickpea, vetch, lupin and field pea were conducted at 20 sites across South Australia in 2020. Some degree of root disease was present at all sites.

A selection of chemical and biological controls for fungi, oomycetes and nematodes were selected in consultation with crop protection experts and applied to seed or in furrow for each trial.

Results were varied. A combination of four actives reduced disease at seven sites, while the nil treatment had the most disease at three sites. The treatments were relatively ineffective, reducing disease at only half of the 20 trial sites.

BACKGROUND

Soilborne fungi, oomycetes and nematodes are known to impact on pulse crop yields, by infecting and damaging the plants' root systems. However, the scale of this impact and, therefore, the cost benefit of treating root disease, is not clear.

This project set out to establish the yield benefit of various root disease treatments, to better quantify the potential yield benefit of disease control and which diseases are most responsive to control.

RESEARCH AIMS

The core objectives of the project were to:

- Assess yield impacts of root disease on grain legumes across South Australia (in collaboration with GRDC Southern Pulse Agronomy project).
- Evaluate management benefits for soilborne diseases of lentil, faba bean, lupin, field pea and chickpea in SA.

IN THE FIELD

A total of 35 field trials were established at 20 sites, in collaboration with the SARDI Pulse Agronomy Group. Effects on disease and nodulation were assessed for all 35 trials, while yield was assessed at 34, biomass at 13 and nitrogen fixation at 11.

The following treatments were applied:

Treatment	Target organisms
A	Oomycetes i.e. *Pythium*, *Phytophthora*
A+B	Oomycetes + fungi (including *Rhizoctonia solani* AG8)
C	Nematodes
A+B + C	Oomycetes + fungi + nematodes
A+B+C+D	Oomycetes + fungi + nematodes + *Fusarium* spp.
Nil	Control – no treatment

Plants were collected from each trial during spring and assessed for root disease, using scores from 0 (no disease) to 5 (high disease/no yield potential).

RESULTS

Root disease was common, with an average score of 2.2 across all sites.

The lowest assessed scores were <1 in lentil and faba bean trials at Farrell Flat, while the highest was >3 in the lentil trial at Warnertown. Moderate disease (>2) was observed at 26 sites, but none showed truly high disease levels (>4).

qPCR assays were also used to assess pathogen loads in root samples from Nil and A+B+C+D treatments. qPCR testing indicated that *Rhizoctonia solani* AG8, *Phoma pinodella*, *Pythium* clade F and P. neglectus were frequently present at the trial sites.

The general treatment effects on root disease scores were not significant. A+B+C+D treatment reduced disease scores by up to 1.01 in lentil at Maitland, and 0.61 in chickpea at Tooligie. qPCR assays indicated ABCD reduced *P. Pinodella* in faba bean at six sites and in lentil at four sites but had limited effect on *Pythium*. ABCD did affect *Pythium* levels in faba bean at three of the sites.

There were significant yield increases with A+B+C+D in chickpea at Bool Lagoon (0.35t/ha) and Tooligie (0.13t/ha), in lentil at Maitland (0.14t/ha) and in faba bean at Sherwood (0.15 t/ha).

Nodulation was checked at eight sites with inconclusive results.

Overall, root disease was found to be common across SA, with no treatment combination providing complete control. The combination of treatments, rates and application methods used in this project was unable to selectively control components of the root disease complex for accurate research.

It was felt that future trials would benefit from the use of fumigation to eliminate background pathogen levels, artificial inoculum to manage pathogen loads, and irrigation to maintain a range of moisture conditions.

VALUE FOR GROWERS

This project has successfully demonstrated that controlling root diseases can deliver measurable yield benefits for growers, with the largest yield effect in these trials being 0.34t/ha in chickpea at Bool Lagoon, but that the value will vary paddock to paddock, and more research is required before best practice management can be recommended.

The project has highlighted the need for improved control methods for root diseases in pulses, both for growers and as a research tool.

MORE INFORMATION:

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