



National Vegetable Extension Network

VegNET
SOUTH AUSTRALIA

**CASE
STUDY**

September 2024

Predicting beet cyst nematode populations in brassicas

Introduction

Beet cyst nematode (*Heterodera schachtii*) is a major nematode pest of brassica crops worldwide.

Substantial productivity loss in brassica crops associated with cyst nematodes has been recorded on the Northern Adelaide Plains, with an estimated \$2.5 million in crop damage to date (past season) and a further \$5.5 million in damages estimated by regional agronomists over the next two years.

This regional issue poses significant challenges in the Northern Adelaide Plains production region and could potentially have flow-on effects to the supply of key crops such as broccoli, leading to price spikes for these commodities if not effectively managed.

Local agronomists and key growers approached AUSVEG SA to assess the problem and it was recommended by local industry to develop a Predicta Pt DNA test for this issue. This DNA-based soil testing service was available through the South Australian Research and Development Institute (SARDI) but came at a commercial cost, therefore investment was needed to help growers manage the issue effectively and sustainably.

The Beet Cyst Nematode Project received funding from the VegNET Innovation Fund for the initial development and extension costs to build a program around beet cyst nematode diagnosis and management. The development of the Predicta Pt DNA test was a vital first investment to ensuring industry could manage this significant problem.

Key messages

- The substantial productivity loss associated with cyst nematodes in brassica crops on the Northern Adelaide Plains presents a significant risk to the region.
- To better understand and manage these losses in productivity, growers required access to an accurate soil test that quantified beet cyst nematode populations. This would allow growers to identify paddocks with high beet cyst numbers and use a quantitative tool to evaluate the effectiveness of management strategies.
- VegNET SA worked with growers, agronomists and researchers from the South Australian Research and Development Institute (SARDI) to deliver a project which developed a Predicta Pt test – a DNA-based soil testing service – for beet cyst nematode diagnosis and management.
- The project successfully developed a DNA test that enables growers and their advisors to quantify *Heterodera schachtii* nematode populations on their properties.

From concept to reality

Twelve growers were involved in the project across three regions: eight in the Northern Adelaide Plains and two each from Western Australia (south west region) and Victoria (Werribee region) where similar issues had been identified.

SARDI was engaged to develop a Predicta Pt test and conduct a field evaluation with the work being led by research scientist Dr Michael Rettke. The project was conducted over 12 months, and an initial meeting with growers and agronomists was held in July 2023 where the strategy for the collection and testing of samples was confirmed.

The field evaluation was conducted by agronomists using the *H. schachtii* test. It enabled affected growers in the region to test and identify baseline nematode numbers on their properties, and therefore allow for the trial and adoption of product-based, cultural and rotational management practices to minimise and suppress numbers.

A total of 78 soil samples collected from 12 brassica growers were tested by SARDI.

Testing of samples – South Australia

Soil samples were collected from a range of cropping situations including prior to planting, in crops with and without symptoms of beet cyst nematode, and from areas with no history of brassica production.

Concentration of *H. schachtii* DNA ranged from below detection to 8245 kDNA copies/g soil. Review of the soil testing results with the collaborating agronomists indicated that the DNA levels of *H. schachtii* detected were consistent with beet cyst nematode symptoms and crop performance observed.

Testing of soil samples pre- and post-fumigation, and in association with use of a trap crop, indicated the test will be a useful quantitative tool for evaluating effectiveness of management strategies.

Testing of samples – interstate

Soil samples were obtained from brassica growing areas in Victoria and Western Australia where symptoms of beet cyst nematode were suspected to have caused damage in previous brassica crops. *H. schachtii* was detected at concentrations ranging from below detection to 1353 kDNA copies/g soil.

Detection of crucifer cyst nematode

Much lower-than-expected *H. schachtii* DNA concentration was detected in soil and plant root samples from a specific site when compared with manual counts of *Heterodera spp.* undertaken as part of test validation.

Polymerase Chain Reaction (PCR) testing (non-quantitative) confirmed crucifer cyst nematode (*H. cruciferae*) was the dominant cyst nematode species present at this site, with only low levels of *H. schachtii* present. Subsequent PCR testing indicated the presence of *H. cruciferae* in samples from the properties of seven from eight growers on the Adelaide Plains and both growers in Werribee.



Image: Effect of beet cyst nematode on growth of cabbage (left) compared to healthy cabbage (right). Credit: Robert Ingram, DAFF



Image: Stunted cabbage plant growth due to high beet cyst nematode numbers (54/250g soil)

Improving grower productivity, profitability, preparedness and competitiveness

The Beet Cyst Nematode Project demonstrated end-to-end problem solving in the region delivered by VegNET SA. The development of the test, field evaluation and field validation achieved the following objectives:

- Demonstrated applied soil health principles and allowed for measurement of future gains from application of management practices
- Provided a test for commercial agronomists to ascertain a base level of nematode populations to inform future trial work into new products and crop management
- Targeted extension work to address a key regional issue and demonstrate how effective integrated pest and soil management principles can address regional pest and disease issues.

This project successfully developed a DNA test that enables growers and their advisors to quantify *H. schachtii* nematode populations on their properties. Going forward, this test will assist in the trialling and adoption of product-based, cultural and rotational management practices to minimise and suppress beet cyst nematode numbers.

Platinum Ag agronomist Paul Pezzaniti worked with growers on the project and said: "This was a really valuable project because it's given growers the opportunity to measure levels of the pest in the soil in order to make management decisions that support their future productivity and profitability."

"They now have options to manage beet cyst nematode that they didn't have before, such as planting in less active time slots, planting other crops where levels are high, and fumigation where needed."

The detection of a second cyst nematode (*H. cruciferae*) infecting brassica crops in the Werribee and Adelaide Plains production areas was very significant as the treatment and management of this nematodes varies and may explain why some measures for beet cyst nematode have not worked as well as expected. SARDI developed a quantitative DNA test for *H. cruciferae* and included it in the SARDI Predicta services that are offered nationally.

The diagnostic test is a legacy asset from the VegNET 3.0 project funding. The Predicta Pt test can be used in any soil type (and can be applied in any affected area) and the SARDI Predicta services are offered nationally. A field validation would be required for different sites and the project proposed a structured program that could be applied to other regions.

The project outcomes can be shared across VegNET in regions with the same issues, such as Victoria.



Image: Field evaluation and crop performance observation



Image: Brassica grower on Northern Adelaide Plains

Next steps

The growers and agronomists involved in the program commenced trials and changes to management practices at the end of the project once the test was developed, and soil samples were collected and tested to identify base levels of the nematode present. An initial trial with a biofumigant showed a reduction in the population where it was used but this was only on one site and requires further testing to demonstrate efficacy and sustainable results. This work is continuing and the growers and agronomists will meet to share their results and work together on management strategies.

A grower feedback session in September 2024 will share the results of the trials and management practices implemented so far. Dr Michael Rettke from SARDI will provide an overview of the test development and the initial findings, particularly the detection of the crucifer cyst nematode and the actions taken.

Paul Pezzaniti, a lead agronomist in this project, recommended further trials to understand the comparison of fumigants versus cover crops to produce long term, sustainable results. If the growers support this recommendation, VegNET SA will identify growers who want to participate in further trials and will liaise with commercial suppliers and other projects to support this work.

The opportunity to apply further funding to investigate the management of both the beet cyst nematode and the crucifer cyst nematode is also being considered. The management of these two nematodes is different, and as they are often found together, a combined approach to effective management is an area for further research.

Further information

Further information

Contact VegNET South Australia Regional Development Officer Peta Coughlin at peta.coughlin@ausveg.com.au or 0409 029 745.

- [Predicta Research – PIRSA](#)
- [Beet cyst nematode on vegetables – Soil Wealth ICP](#)
- [Beet cyst nematode on vegetables – AUSVEG](#)
- [Pests, diseases and disorders of brassica vegetables: A field identification guide – Soil Wealth ICP](#)
- [Pest and weed manager | Biosecurity](#)



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