Irrigation, nutrition & Verticillium

Collaborative research by the Australian Cotton Disease Collaboration is currently exploring the interaction of irrigation and nutrition management options on the impact of Verticillium wilt of cotton.

THE ACDC
The Australian Cotton Disease Collaboration

Background

- *Verticillium dahliae* is a highly persistent soil-borne pathogen prevalent in many cotton valleys.
- Verticillium survives in the soil as tough survival structures (microsclerotia) for up to 14 years. Up to 250,000 microsclerotia can be produced from one infected cotton plant, making it difficult to manage once established in a field.
- Scientific literature reports that Verticillium reduces cotton yield with excessively wet soils and high nitrogen availability.

Conditions that reduce Verticillium severity and yield impact are:

- Maximum air temperature greater than 30°C for lengthy periods through the cotton season.
- Soil temperature greater than 25°C.
- Consistently high solar radiation days, and open well-lit cotton canopies.
- Quality irrigation management without 100% saturation and drier than expected root zones with high oxygen availability.
- Zero rank growth, maintaining a hot canopy with open inter-rows, drier upper soil depths, and small cotton plants.
- A balanced nutrition regime that reduces excess nitrogen availability and provides adequate potassium availability.
- Very finely-pulverised cotton stubble, buried and broken-down by active soil biology (opposite to Fusarium management – on surface and solarise).

Why are we doing this research?

This research is designed to provide practical, evidenced-based answers to support on-farm decision-making.

Key questions being investigated:

1. Can irrigation management help reduce the impact of Verticillium wilt on cotton yield?
2. Can optimising nitrogen inputs help reduce disease impacts and protect yield potential?

Where are we up to?

Year one of a three-year research program has been conducted east of North Star, investigating how irrigation management under different systems influences Verticillium wilt development, symptom severity and final yield.

Trials involved:

- Comparing DRY/WET/NORMAL irrigation strategies under both pivot and furrow irrigation systems.
- Monitoring soil moisture, temperature and soil variability (e.g. ECa mapping) to better understand factors influencing disease development.
- Assessing Verticillium incidence and severity throughout the season.
- Measuring yield and fibre quality outcomes.

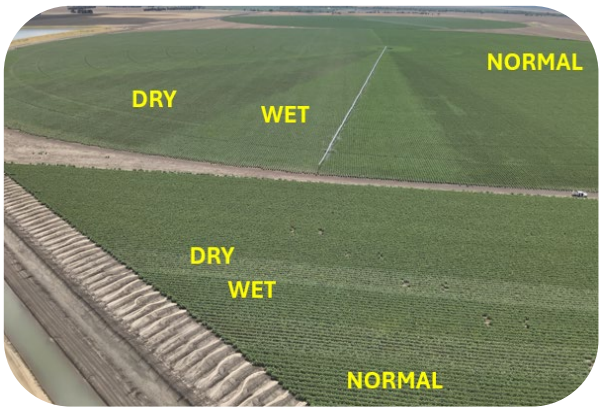
What's next?

During the 2026-27 season, the project will investigate how nutrition management and irrigation practices can be used together to reduce disease impacts.

Upcoming work will include:

- Glasshouse trials examining the influence of nitrogen, potassium and phosphorus on Verticillium development.
- Field trials at North Star and a collaborative site on the LEIFS project, evaluating how nitrogen rate, irrigation management and soil variability interact to influence disease risk and crop performance.

Understanding where Verticillium risk is highest within a paddock can help target management decisions and make every megalitre count.



Treatments under Pivot and Surface furrow irrigation systems included DRY, NORMAL and WET

Preliminary results

Key findings from the pivot trial to date include:

- WET treatment resulted in higher disease severity earlier.
- Same yield observed for WET and DRY treatments, although 1ML/ha difference in irrigation was applied.
- Verticillium incidence increased rapidly from initially low levels.
- Seasonal conditions were relatively warm, resulting in generally low disease severity and limited impact on yield across the trial.
- Background soil electrical conductivity (ECa) varied across the trial and was significantly correlated with disease incidence and Verticillium level present in the soil. This suggests soil variability may play an important role in identifying areas at greater disease risk.

Taller lush growth of WET treatment, cooler soils, lower light penetration.

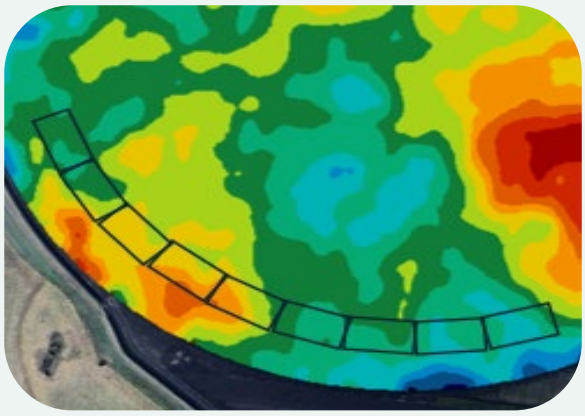


DRY treatment with lower vegetation levels and higher light penetration and soil temperature.

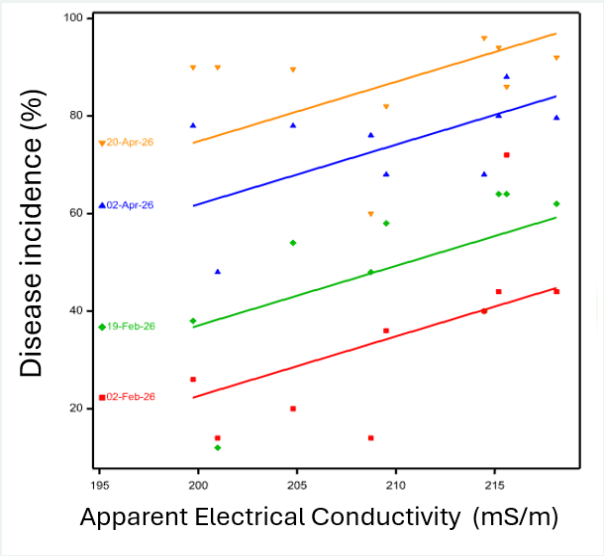


Yields were similar across all treatments, with no significant yield advantage observed.

Irrigation treatment	Yield (b/ha)
DRY	11.4
NORMAL	12.3
WET	11.4



Variable soil ECa levels across trial plots



Increasing disease incidence was statistically correlated (p<0.005) with increasing soil ECa

How will this work benefit Australian cotton growers and industry?

Improved irrigation and nutrition recommendations could help limit the impact of Verticillium on cotton yields. Understanding soil water holding capacity variations with Verticillium incidence will help identify potential "hot spots" and refine future irrigation management trials.

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Find out more

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