ACDC

A collaborative approach to cotton disease research to reduce the economic impact of current and emerging diseases.

ACDC's mission is to reduce the impact of diseases in cotton to less than 5 per cent of the cost of production through research on key areas.

Disease is one of the biggest challenges facing Australian cotton growers today. It is more than just a nuisance — we know it reduces yields and shakes confidence in the long-term viability of cotton production. In some extreme cases, the pressure has been so severe that growers have opted out of cotton.

That's why the industry is taking action. The Australian Cotton Disease Collaboration (ACDC) is a $13 million research, development and extension program driven by the Cotton Research and Development Corporation (CRDC). Our mission? To help growers stay ahead of disease and protect the future of cotton production in Australia.

Through ACDC, CRDC is collaborating with leading experts at the University of Southern Queensland (UniSQ) and Queensland's Department of Primary Industries (Qld DPI). Together, we're tackling the problem from every angle by developing smarter, systems-based disease control strategies, unlocking the secrets of pathogen behaviour, harnessing spatial data analytics, and investigating fungicides and plant defense mediators to test against diseases of cotton.

The goal is simple: we want cotton growers to have the knowledge and solutions they need to keep the industry strong and profitable for years to come.

Disease diagnostic support for Australian cotton growers

This suite of national cotton pathology projects is building fast, reliable diagnostic tools and support services to help growers detect and manage key diseases across Australia. By developing faster and more reliable diagnostic tests, expanding diagnostic capacity to the Northern Territory and Western Australia, and collecting pathogen samples for future research, these projects are improving early disease identification, identifying emerging threats, and strengthening local expertise. Together, these efforts are equipping growers in both established and new cotton regions with the evidence and skills they need to protect their crops health and make better management decisions.

These projects include:

- **Diagnostic development and pathology support to cotton growers in Qld** *(Lead: Dr Dinesh Kafle, Qld DPI)*
- **Pathology support to cotton growers and delivering ACDC project activities in NSW** *(Leaders: Dr Sam Peryiannan, UniSQ; Dr Chi Nguyen, UniSQ).*
- **Pathology support to cotton growers in NT and WA** *(Leaders: Dr Dinesh Kafle, Qld DPI; Sarah Nolan-Gorman, WA DPIRD; Dr Edward Mwando, NT DAF)*

National pathogen surveillance and reference resources

These projects are building resources needed to monitor how cotton diseases evolve over time. By creating a national pathogen collection and mapping key genomes, they will enable earlier and more accurate identification of emerging strains and support disease management. Together, these efforts strengthen biosecurity and protect the productivity of Australia's cotton industry.

Establishing the Australian cotton pathogen collection

LOCATION: UniSQ (Toowoomba)

LEAD: Dr Cassy Percy (UniSQ)

ACDC is setting up a national collection of cotton disease pathogens found in Australia. Having a clear understanding of the strains and genetics that are present in the industry and used in research is important to understand variety response, crop rotation choice and management recommendations.

Monitoring pathogen genetic diversity

LOCATION: UniSQ (Toowoomba)

LEAD: Dr Alexandros Georgios Sotiropoulos (UniSQ)

This project is keeping an eye on how cotton diseases change over time by studying their genetic makeup. By tracking these changes, we can see how pathogens move between regions, adapt to new cotton varieties or even survive on other plants. This helps us identify the most aggressive strains early.

We're also building a database of pathogen genomes, which will make it easier in the future to diagnose diseases quickly and understand which strains are causing problems in different areas.

Reference genome for cotton pathogens

LOCATION: UniSQ (Toowoomba)

LEAD: Dr Alexandros Georgios Sotiropoulos (UniSQ)

A reference genome is a high-quality, complete DNA sequence that serves as a baseline. It acts like a map of all the genes and genetic elements in an organism, allowing researchers to compare other genomes to identify variations, study gene functions and biological processes and detect mutations linked to traits or diseases. This project is mapping the genetic makeup of understudied pathogens such as *Berkeleyomyces rouxiae*, which causes black root rot, the *Eutypella*, which causes reoccurring wilt, and *Corynespora* species, which causes target spot.

By learning more about their genes, Australian growers will have better tools to identify these diseases early and manage them effectively. These new resources will also help track changes in these pathogens over time, so we can spot highly aggressive strains before they cause major problems.

Understanding and detecting cotton pathogen infections

These projects aim to better understand how cotton pathogens behave – how they move, infect plants and interact with one another – so that disease can be detected earlier, diagnosed more accurately, and managed more effectively in the field.

Pathogen inoculum: spore trapping to detect aerial spores of cotton pathogens

LOCATION: Central and northern Qld for field sites to conduct spore trapping, and Brisbane (Qld), Toowoomba (Qld), Urrbrae (SA) for researcher locations.

LEAD: Dr Dinesh Kafle (Qld DPI)

Spore trapping is a way to catch fungal spores floating in the air so we can spot diseases early and act before they spread. This project is testing spore traps to see if they can pick up leaf spot pathogens and the Eutypella fungus that causes recurring wilt in cotton. If spore trapping proves to work well, it will help us understand how these diseases move and spread, and guide future research into better management options.

Host range and cotton differential set identification for key cotton pathogens

LOCATION: UniSQ (Toowoomba)

LEAD: Dr Cassy Percy (UniSQ)

While there has been a large amount of previous work, changes in strains means that currently we don't fully understand the range of plants these pathogens can infect. This project is working to strategically fill this gap by building resources that will help develop better disease management strategies for growers.

By creating cotton germplasm resources and a 'differential set' (a collection of cotton lines with known reactions to specific pathogens), researchers will be able to study virulence patterns.

Co-infection assays to study pathogen interactions

LOCATION: UniSQ (Toowoomba)

LEAD: Dr Sadegh Balotf (UniSQ)

Where two or more pathogens are present, there can be interactions that makes the disease harder to manage and can result in worse symptoms resulting in higher seedling losses and yield losses.

This project will help improve our understanding of how different pathogens interact and the impact this has on disease development in cotton. It will also develop tools to detect and measure when multiple pathogens are present, supporting more informed on-farm decisions for managing these complex disease issues.

Farming system management

These projects are exploring how different management practices, such as irrigation, nutrition and residue management, influence the severity and persistence of key cotton diseases. By testing how farming decisions affect disease levels, this research aims to identify practical strategies growers can use to reduce risk and protect crop productivity.

Irrigation and nutrition management to reduce cotton wilt disease incidence

LOCATION: North Star and Darling Downs (Qld) for field sites, Toowoomba (Qld) for glasshouse trials, and Brisbane and Toowoomba (Qld) for researcher locations

LEADERS: Linda Scheikowski (Qld DPI), A/Prof Joseph Foley (UniSQ)

Irrigation and nutrition play a big role in cotton wilt diseases, but most of what we know in Australia is based on grower experience rather than hard data. This project is working to quantify how Verticillium and Fusarium wilt under different management affect crops and turn that into practical management advice. The goal is to help growers cut yield losses by improving wilt control, make better use of water by irrigating at higher soil moisture deficits, and boost profits by reducing unnecessary fertiliser and lowering disease levels.

Contribution of cotton residues to inoculum carryover

LOCATION: Brisbane and Toowoomba (Qld)

LEAD: Linda Scheikowski (Qld DPI)

The fungi that cause Verticillium, Fusarium, and Reoccurring wilts can hang around in old cotton plant material. However, it is unclear how much of this remaining crop residue contributes to disease risk in following crop. To address this, we need to measure how long these pathogens survive as the trash breaks down and test management interventions. This project is reviewing the best ways to test for these pathogens in cotton residues and develop recommendations on management of stubble.

The black unknown: Linking knowledge and innovation for management of black root rot

LOCATION: Charles Sturt University (CSU, Wagga Wagga, NSW) and field sites (Griffith, NSW)

LEADERS: Dr Sadegh Balotf (UniSQ), Dr Ben Stodart (CSU)

Black root rot has become a serious problem for cotton production in NSW, especially in the southern region. This project in collaboration with SummitAg and CottonInfo is building local expertise to better understand how big the risk is and what drives the disease. By learning more about black root rot, we can develop practical strategies to manage it and keep cotton production sustainable in the south.

Analytics and technology

These projects focus on using digital tools, modelling and automation to improve how cotton diseases are detected, tracked and managed. They aim to deliver faster, more accurate diagnosis and better prediction of disease risk. The goal is to give growers practical, technology-driven tools that support early intervention and more targeted management decisions across cotton production systems.

Spatial data analytics and advanced modelling for disease prediction and management in Australia

LOCATION: UniSQ (Toowoomba and Springfield)

LEADERS: Prof Ravinesh Deo (UniSQ), A/Prof Linda Smith (Qld DPI)

To manage disease, we need accurate tools to predict and track outbreaks. This project is developing new mapping and data tools that use advanced modelling and AI to help the industry stay ahead of disease problems. These tools will make it easier to predict where and when diseases are likely to occur and show this information clearly on maps. They'll also provide data-driven insights to guide smart, targeted actions – helping growers manage disease more effectively and protect their crops.

Develop machine vision systems to detect and differentiate *Verticillium* and *Fusarium* wilts

LOCATION: UniSQ (Toowoomba)

LEAD: A/Prof Alison McCarthy (UniSQ)

At present, diagnosing Verticillium and Fusarium wilt in the field is still a manual process. This project is working on new technology using machine vision to spot and tell the difference between these wilts – even before symptoms appear. With this technology, growers will be able to identify wilt early, map areas likely to have high disease pressure, and adjust management practices like irrigation and nutrition to reduce the impact.

Crop protection products

There is a very limited suite of products available to Australian cotton growers to manage cotton diseases. Many fungicides and plant defence mediators vary in effectiveness, and some are not registered for use in Australia or in cotton. This project (**Review of fungicides and plant defense mediators** led by Prof Levente Kiss, UniSQ) is reviewing how well these products perform here and overseas, helping the industry identify which options are genuinely useful and worth pursuing for cotton disease management. This will inform initial highly controlled environment studies to systematically screen fungicides under laboratory and glasshouse conditions prior to field trials of a more limited range of products.

Collaborative trials with industry partners

AFF farm trials with butterfly pea, sorghum and maize cover cropping for Verticillium wilt reduction in collaboration with CottonInfo and NSW DPIRD.

Sampling method validation in collaboration with Crown Analytical Services and CottonInfo.

Pathogen inoculum studies in short, long-term rotation and various soil moisture (irrigated, semi-irrigated and drought) trials in collaboration with Future Drought project (NSW DPIRD).

CONTACTS

General ACDC enquiries

acdcnationalcentre@unisq.edu.au

Key project leads

Prof Sambasivam (Sam) Periyannan, ACDC Director and project lead
Crop Molecular Genetics, UniSQ
sambasivam.periyannan@unisq.edu.au

A/Prof Linda Smith, ACDC Deputy Director and project lead
Principal Plant Pathologist, Qld DPI, Adjunct Associate Professor UniSQ
linda.smith@dpi.qld.gov.au

Dr Sadegh Balotf
Research Fellow, Plant Pathology, UniSQ
sadegh.balotf@unisq.edu.au

Prof Ravinesh Deo
Professor (Mathematics), UniSQ
ravinesh.deo@unisq.edu.au

A/Prof Joseph Foley
Water Engineering & Irrigation, UniSQ
joseph.foley@unisq.edu.au

Dr Dinesh Kafle
Plant Pathologist, Qld DPI
dinesh.kafle@dpi.qld.gov.au

Prof Levente Kiss
Director, Centre for Crop Health, UniSQ
levente.kiss@unisq.edu.au

A/Prof Alison McCarthy
Irrigation and Cropping Systems, UniSQ
alison.mccarthy@unisq.edu.au

Dr Edward Mwando
Cropping Group Leader, NT DAF
edward.mwando@nt.gov.au

Linda Scheikowski
Senior Plant Pathologist, Qld DPI
linda.scheikowski@dpi.qld.gov

Sarah Nolan-Gorman
Research Scientist, WA DPIRD
sarah.nolan@dpird.wa.gov.au

Dr Cassy Percy
Senior Research Fellow, Plant Pathology, UniSQ
cassy.percy@unisq.edu.au

Dr Murray Sharman
Principal Plant Pathologist (Virology), Qld DPI
murray.sharman@dpi.qld.gov.au

Dr Alexandros Georgios Sotiropoulos
Research Fellow, Bioinformatics, UniSQ
alexandrosgeorgios.sotiropoulos@unisq.edu.au

Dr Ben Stodart
Senior Lecturer Plant Biology, CSU
bstodart@csu.edu.au

ACDC Manager

Liz Neary
acdcnationalcentre@unisq.edu.au

CRDC Innovation Brokers

Elsie Pearce (Parental leave until Jan 2026)
elsie.pearce@crdc.com.au

Susan Maas
susan.maas@crdc.com.au

Industry Advisory Group

Queensland
Nic Clapham, Grower
Dave Kelly, Consultant
Doug McCollum, Policy Officer, Cotton Australia

New South Wales
Mick Humphries, Grower
Karen Kirkby, Plant Pathologist, NSW DPIRD
Steve Madden, Consultant
Heath McWhirter, Consultant
Richie Quigley, Grower
Elle Storrier, Consultant

Northern Territory
Simone Cameron, Senior Policy Manager, Cotton Australia

scan **TO FIND OUT MORE**