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RESEARCH AREA

**Co-infections and disease
complexes in Australian cotton**

Tell us a bit about yourself?

I'm originally from Iran and currently a Research Fellow at the Centre for Crop Health (CCH), University of Southern Queensland (UniSQ). My research journey in Australia began at Murdoch University, where I worked as a visiting researcher from 2016 to 2018 while completing my first PhD on nitrogen use efficiency in wheat. Following that, I pursued a second PhD at the University of Tasmania, focusing on powdery scab disease of potato. After completing this PhD in 2022, I began a research position at CCH to continue working in plant pathology.

How did you end up in cotton research?

I joined UniSQ to contribute to a diverse range of plant pathology projects, including genome analysis of crop pathogens, investigations into fungicide resistance in fungal populations, and studies of molecular interactions between plants and pathogens. When the Australian Cotton Disease Collaboration (ACDC) was launched in 2024, I was offered a Research Fellow position to lead a project focused on pathogen co-infections and disease complexes in cotton. I really liked the project and the opportunity it presented to work on a new crop and explore a different cropping system within a research-driven industry.



What excites you about working in the Australian cotton industry?

The Australian cotton industry is innovative, science-led, and open to collaboration. What excites me most is the strong research culture and how welcoming the industry has been to new researchers and ideas. Having worked with various crops, I've found cotton to be a dynamic field where I can contribute meaningfully. It's rewarding to work in a sector that values evidence-based solutions and is focused on long-term sustainability and grower success.

What do you like to do when you're not researching?

Outside of research, I'm a passionate football fan, both watching and playing. I closely follow matches and rarely miss a game. I also enjoy gardening, which connects well with my professional interests.

PROJECT OVERVIEW

ACDC Project B3.1: Co-infection assays to study synergistic and antagonistic interactions

Explain your current research project

This project investigates co-infections and disease complexes in Australian cotton crops. Many cotton diseases involve more than one pathogen, and in some cases, plants are affected by multiple pathogens at the same time. This can result in more severe disease symptoms, complicated diagnoses, and reduced effectiveness of standard management strategies. However, most existing research focuses on individual pathogens in isolation, leaving a critical gap in our understanding of how multiple pathogens interact and influence overall disease outcomes.

Our project aims to provide a national overview of which pathogen combinations commonly occur together in cotton fields and examines how they interact, whether they intensify symptoms, compete for space or resources, or coexist without significantly affecting each other. This project addresses a critical knowledge gap by estimating the prevalence of naturally occurring disease complexes in the field and conducting detailed investigations of key pathogen combinations under laboratory and controlled conditions. By gaining these insights, the project helps move beyond simplified single-pathogen models. The ultimate goal is to improve disease diagnosis, guide more effective treatment decisions, and contribute to more sustainable and informed disease management practices.

The research is being conducted in collaboration with cotton pathologists, diagnostic teams, and the national cotton pathogen collection. We analyse field survey data collected each season to identify cases where multiple pathogens are reported from the same field. In the laboratory, pathogens known to cause the same disease are co-cultured on artificial media to observe their interactions. These may be synergistic, antagonistic, or neutral. Selected combinations are then tested in controlled glasshouse trials, where cotton plants are co-infected to observe how the disease progresses and how the pathogens behave inside the host.

The project is based at UniSQ in Toowoomba. Field survey data is collected from all cotton-growing regions across Australia.

How will this work benefit Australian cotton growers and industry?

By improving our understanding of co-infections and disease complexes in cotton, this project supports more accurate and confident diagnosis in the field, particularly in cases where symptoms don't clearly match those caused by a single known pathogen. By identifying which pathogen combinations commonly occur together and how they interact, the project can help clarify when complex infections may be contributing to unexpected disease outcomes.

This information will assist growers, agronomists, and diagnostic services in recognising disease complexes earlier and adjusting their management accordingly. While the project is research-focused, its outcomes will help lay the groundwork for more targeted diagnostics, more effective extension messaging, and better long-term decision-making around disease control in Australian cotton systems.



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