

Diversity and Taxonomy of Airborne and Pathogenic Fungi in Southwest of Western Australia

Diman Krwanji, Mary Hanson, Kristina Lemson, Carla Zammit
Edith Cowan University
School of Science
Conservation and Biodiversity Research Centre

Background

The research highlights the biodiversity of fungi in Australia, with only ~6% recorded, and emphasises the unique fungal communities shaped by the continent's isolation, climate, and human activities. Fungal phytopathogens threaten plant health, biodiversity, and food security, with airborne spores playing a key role in disease spread. Examples include *Puccinia graminis* causing wheat stem rust and *Austropuccinia psidii* causing Myrtle rust, which significantly impact ecosystems dominated by Myrtaceae. Despite the importance of fungi in plant health and ecosystem balance, little is known about airborne fungal diversity in Western Australia, particularly regarding airborne dispersal and persistence of foliar pathogens. This research seeks to address this gap by studying airborne fungal communities and their interactions with environmental factors.

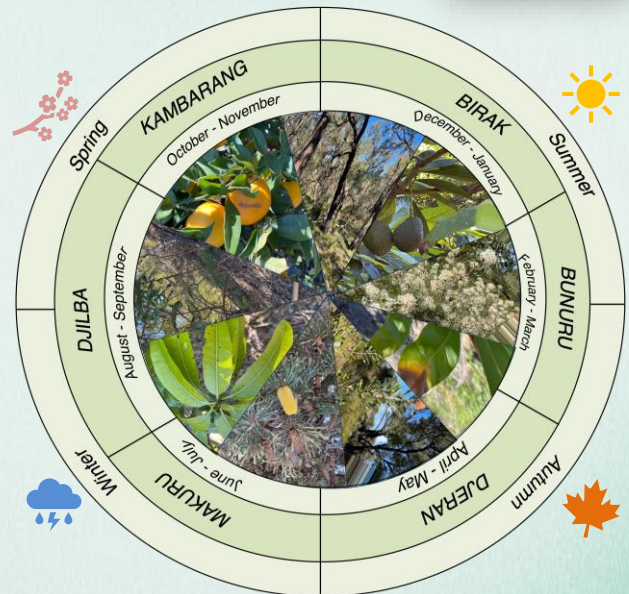


Aims & Objectives

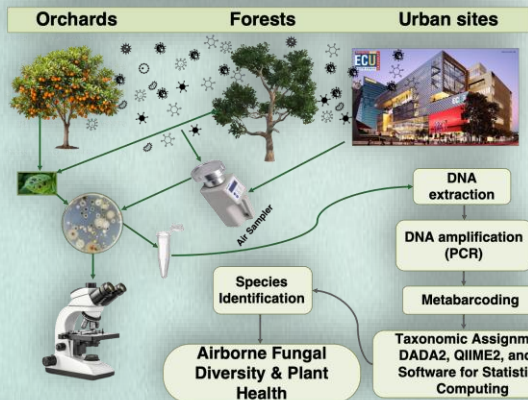
Aim of this PhD project is to determine the diversity taxonomy of fungal pathogenic and the effect of anthropogenic and environmental factors on the diversity of airborne fungi and their implications for plant health.

Objectives:

- Describe the diversity and composition of airborne fungal communities in different ecosystems.
- Evaluate the impact of environmental factors and seasonal variations on the abundance of diversity of fungal communities.
- Determine the abundance of plant pathogens in the airborne fungal communities.
- Determine the diversity and taxonomy of pathogenic fungi in southwest of Western Australia.



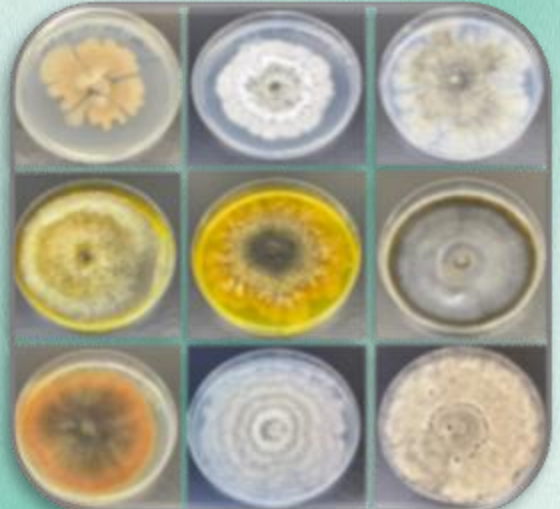
Airborne Fungi & Leaf Sampling



Preliminary results

Different fungi have been isolated below are some examples of isolated fungi collected from the different habitats.

- Distinct colony morphotypes observed (shape, texture, colour differ markedly)
- Variable growth dynamics and structural features across isolates
- Multiple habitat-derived fungal taxa present, reflecting ecological diversity



Methods Overview:

- Sampling Strategy:** Airborne fungal communities collected from forests, orchards, and urban areas using portable air samplers across six Noongar seasons.
- DNA Extraction & Sequencing:** DNA extracted from air and leaf samples using metabarcoding and Sanger sequencing. NGS PacBio employed for fungal diversity profiling.
- Data Analysis:** Diversity assessed using PERMANOVA, PCA, and NMDS. Weather data integrated to study environmental impacts on fungal spore abundance.
- Pathogen Identification:** Advanced bioinformatics technology used to identify plant pathogens, including undiagnosed species, with phylogenetic validation.
- Taxonomic Survey:** Fungal diversity and taxonomy described, with findings deposited in NCBI. Environmental and land-use impacts analysed.

