



# PREHARVEST DISEASE MANAGEMENT

## Objectives

To study the epidemiology and ecology of preharvest plant pathogens and develop sustainable and integrated disease management strategies through fundamental and applied research.

## Epidemiology of pathogens

The release of fungal spores in vineyards, orchards, plantations and fields are determined by spore counts and quantitative PCR, and compared to environmental variables such as temperature and moisture.



## Ecology of plant pathogens

The interaction of plant pathogens with other organisms, such as fungi, bacteria, nematodes and insects, above and below the soil are studied to determine factors contributing to disease suppression or enhancement in orchards, plantations and fields.



## Chemical control

- **Evaluation of fungicides and surface disinfectants**

Fungicides, surface disinfectants and adjuvants new to the South African market are continuously evaluated for efficient control of plant pathogens.



- **Use of plant resistance activators**

Some chemicals known to induce the plant's own defense responses are tested against fungal pathogens and their toxic metabolites. These chemicals are often natural products that are both non-corrosive and environmentally friendly.



- **Enhanced spray application**

Optimisation of spray application is studied through the use of a deposition assessment protocol, which consists of fluorometry, photomicrography and digital image analyses. This allows for the development of deposition benchmarks, which in turn helps to determine safe and economical spray techniques, volumes and chemical rates.

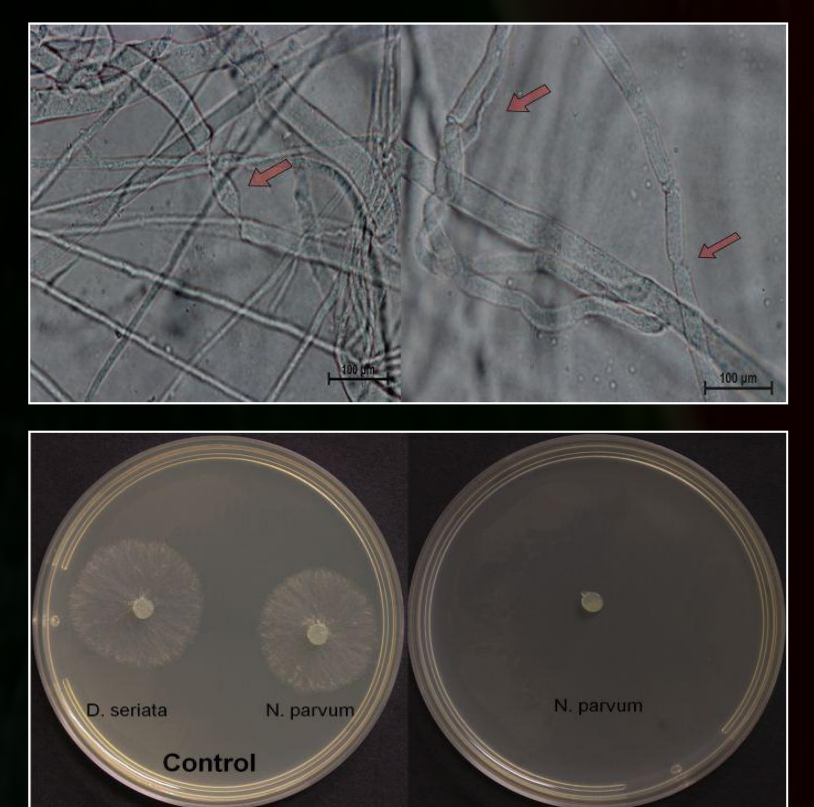
- **Fungicide resistance**

The presence of fungicide-resistant plant pathogens following the application of fungicides are determined by *in vitro* and PCR techniques.

## Biological control

- **Evaluation of biocontrol candidates**

Fungi and bacteria that suppress plant diseases through antibiosis, competition and plant induced resistance are isolated from healthy plants and evaluated for control of pathogens *in vitro*, in the greenhouse and under field conditions.



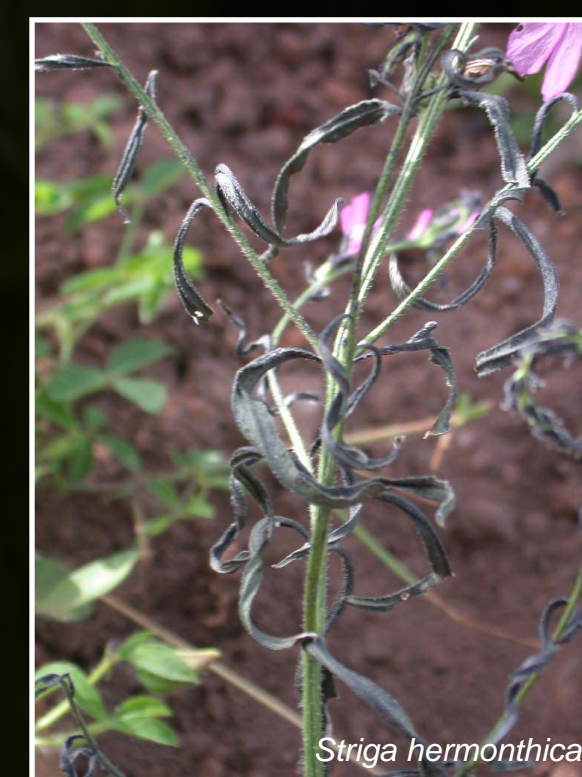
- **Plant bio-enhancement with non-pathogenic fungi**

The use of fungal endophytes that are non-pathogenic to plants are used to control diseases caused by their pathogenic counterparts.



- **Bioherbicides**

The fungus *Pseudolagarobasidium acaciicola*, is used for the control of *Acacia cyclops*, commonly known as rooikrans, in the Western Cape. Rooikrans is an alien plant species that threatens the diversity of the fynbos and strandveld vegetation. *Fusarium oxysporum* f. sp. *strigae* is used for controlling the parasitic weed *Striga hermonthica* on grain crops in Africa.



## Cultural control

- **Sanitation practices**

The introduction of pathogens into disease-free areas can be prevented by using clean planting materials, equipment and vehicles. Plant debris that contain fruiting structures are removed, treated or destroyed by good farm sanitation practices.



- **Irrigation management**

Irrigation is applied to reduce the development of plant diseases. Sources of irrigation are also treated to prevent the further dissemination of pathogens.



## Host resistance

- **Evaluation of breeding lines and hybrids**

Breeding material and hybrids of fruit and grain crops are regularly screened for resistance to a range of fungal pathogens and their pathogenicity factors (toxins, enzymes), and in a number of environments.



- **Plant response to pathogens**

The structural and biochemical responses associated with host resistance in plants are studied to understand the means whereby plants could be improved against pathogens.

