

Prof Jacque van der Waals: MSc projects 2023

1. **Efficacy of azoxystrobin in management of Botrytis grey mould, and determination of sensitivity profile of *Botrytis cinerea* populations in South African citrus orchards**

Botrytis cinerea is an important citrus fungal pathogen, which is most prevalent during cool, moist conditions and causes grey mould in fruit. *Botrytis cinerea* is associated with the premature flower drop of lemons, as well as destructive preharvest and postharvest fruit rot. Rind distortions of fruit is a common symptom related to infection of blossoms by this pathogen. Control of diseases caused by *B. cinerea* is largely dependent on the application of fungicides, including azoxystrobin, but to date there are no registered fungicides available for the control of *B. cinerea* on citrus in South Africa. *Botrytis cinerea*, however, is prone to develop resistance to fungicides and thus it is critically important to monitor pathogen populations for mutations that confer resistance. Good stewardship in fungicide use is also necessary to extend the lifespan of active ingredients such as azoxystrobin. This includes evaluation of spray programmes, with respect to timing and number of applications, as well as inclusion of contact fungicides in tank mixes with systemics.

The first objective of this project is to collect *B. cinerea* isolates from the Eastern and Western Cape growing areas (collection starting Sept 2022) in order to screen these isolates for mutations that confer resistance to azoxystrobin, using molecular markers. The second objective is to evaluate the efficacy of various spray programmes to manage Botrytis in citrus. These will include azoxystrobin alone, azoxystrobin with a contact fungicide, benomyl alone, and azoxystrobin with selected biological control agents (project #5). These field trials will be conducted in orchards in the Western Cape, and as such, the student will work closely with Dr Jan van Niekerk and his technical assistant, Mr Charles Stevens (both SUN-CRI). Trials will be laid out in randomised block designs in designated orchards, which will then be sprayed according to the different fungicide / BCA treatments through the infection period (September to October). Blossoms will be collected at three intervals for determination of Botrytis infection. Blossom infection will be evaluated using three techniques, namely moisture chamber incubation, moisture chamber incubation after surface sterilisation, and PCR. Isolations will be made from blossoms displaying sporulation in moisture chambers. The orchard trial will be repeated.

Results from this project will inform the citrus industry in SA on the best practices for management of Botrytis in orchards.

Requirements and skills needed: The student on this project must possess a South African driver's licence and be willing to travel to the Western Cape growing region on a regular basis in the summer. Ability to understand and speak Afrikaans is an advantage. The student must be willing to do physical labour, and interact with growers.

2. Efficacy and modes-of action biological control agents in the control of *Botrytis cinerea* in South African citrus orchards

Botrytis cinerea is an important citrus fungal pathogen, which is most prevalent during cool, moist conditions and causes grey mould in fruit. *Botrytis cinerea* is associated with the premature flower drop of lemons, as well as destructive preharvest and postharvest fruit rot. Rind distortions of fruit is a common symptom related to infection of blossoms by this pathogen. Control of diseases caused by *B. cinerea* is largely dependent on the application of fungicides, including azoxystrobin, but to date there are no registered fungicides available for the control of *B. cinerea* on citrus in South Africa. *Botrytis cinerea*, however, is prone to develop resistance to fungicides and thus it is critically important to monitor pathogen populations for mutations that confer resistance. Good stewardship in fungicide use is also necessary to extend the lifespan of active ingredients such as azoxystrobin. This includes evaluation of spray programmes, with respect to timing and number of applications, as well as inclusion of contact fungicides in tank mixes with systemics. Also important in the light of the retraction of many fungicides from the market, is to incorporate the use of biological control agents (BCAs) into management programmes.

The first objective of this project is to collect *B. cinerea* isolates from the Eastern and Western Cape growing areas (collection starting Sept 2022) in order to screen various commercially available BCAs the *B. cinerea* isolates, using different methods to determine the modes-of-action of the BCAs. The second objective is to evaluate the efficacy of various spray programmes to manage Botrytis in citrus. These will include azoxystrobin alone, azoxystrobin with a contact fungicide, benomyl alone (project #4), and azoxystrobin with selected biological control agents (this project). These field trials will be conducted in orchards in the Western Cape, and as such, the student will work closely with Dr Jan van Niekerk and his technical assistant, Mr Charles Stevens (both SUN-CRI). Trials will be laid out in randomised block designs in designated orchards, which will then be sprayed according to the different fungicide / BCA treatments through the infection period (September to October). Blossoms will be collected at three intervals for determination of Botrytis infection. Blossom infection will be evaluated using three techniques, namely moisture chamber incubation, moisture chamber incubation after surface sterilisation, and PCR. Isolations will be made from blossoms displaying sporulation in moisture chambers. The orchard trial will be repeated.

Results from this project will inform the citrus industry in SA on the best practices for management of Botrytis in orchards.

Requirements and skills needed: The student on this project must possess a South African driver's licence and be willing to travel to the Western Cape growing region on a regular basis in the summer. Ability to understand and speak Afrikaans is an advantage. The student must be willing to do physical labour, and interact with growers.

Skills that are required for both of these projects include:

- Good writing and presentation skills
- Layout, design and maintenance of field and greenhouse trials
- Appropriate working knowledge of statistics
- Ability to work meticulously, keep good records and work under pressure

- Excellent laboratory skills, in particular working with fungi (eg. hyphal tipping, dilution series, making storage cultures)
- PCR and sequencing
- Ability to work independently and as part of a team
- Advanced understanding of FRAC

Please submit your CV, undergraduate (and Hons if applicable) marks and a cover letter to Prof Jacquie van der Waals (jacquie@cri.co.za)

Closing date for applications: 1 August 2022

NOTE: Final allocation of projects is dependent on allocation of funding from CRI