

Imazalil and alternatives: wax application research

Charles Stevens





INTRODUCTION

- South African citrus industry is export driven and therefore dependent on high quality fruit
- During harvesting processes wounds occur on the fruit due to inadequate protection and handling
- These injuries may function as infection sites for major postharvest pathogens such as green mould
- Citrus green mould is caused by *Penicillium digitatum*



INTRODUCTION

- The South African citrus industry depends on the use of synthetic fungicides to control postharvest diseases
- Imazalil (IMZ) is the most reliable fungicide in use
- However, IMZ and its existing maximum residue levels are under review and has the risk of being recalled and therefore alternatives need to be looked at
- **AIM: The use of alternative fungicides to IMZ in wax to control citrus green mould**



INTRODUCTION

- Azoxystrobin (AZX), pyrimethanil (PYR) and fludioxonil (FLU) are also fungicides that are active against *P. digitatum* strains that show resistance to TBZ and IMZ
- AZX (strobilurin) has been registered for citrus use in the United States and also South Africa
- PYR (anilinopyrimidine) has been registered for use since resistance against older fungicides are a problem
- FLU (phenylpyrrole) and is a newly registered fungicide for postharvest use on citrus in South Africa



Materials and Methods

- Untreated lemon, navel and mandarin fruits were collected from citrus orchards in the WC
- IMZ sensitive isolate of PD plated on PDA was used to prepare spore suspensions, at a final concentration of 1×10^6 spores.mL⁻¹
- Fruit were treated with PYR and FLU at registered concentrations of 4000ppm and 2600ppm and AZX at a concentration of 4000ppm in food-based shellec wax formulation on a commercial waxing applicator
- These fungicides were used as single treatments as well as in combination with one another
- In addition, Evolve (AZX + FLU) tested



Materials and Methods

- **Protective control** – fruit were inoculated with spore suspension using a 5 mm wounding tool with four wounds on the shoulder of each fruit
- **Sporulation inhibition** – fruit were inoculated with 0.2 mL of spore suspension using a sterile 0.60 x 25 mm gauge needle. One inoculation point, on the shoulder of each fruit, was injected beneath the rind of the fruit



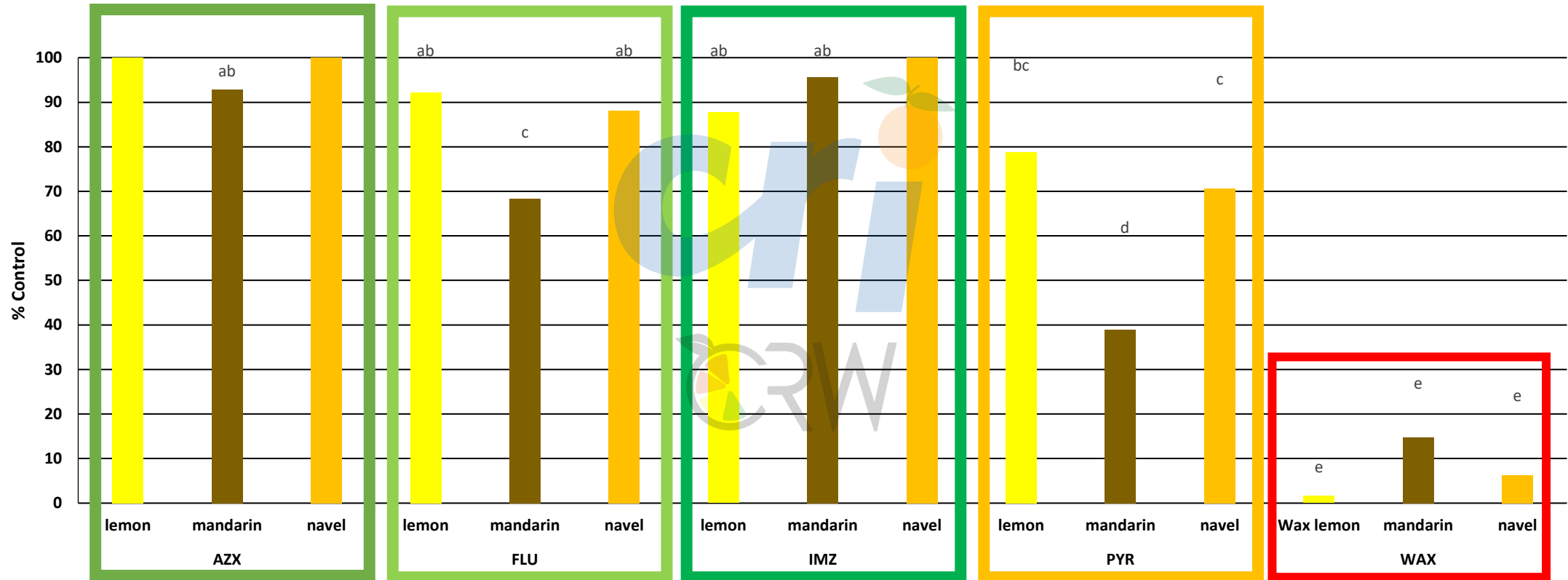
Materials and Methods

- Fruit were packed in boxes. Each box was covered with a transparent polyethylene bag and sealed and then incubated at 22°C
- Protective control fruit was evaluated after 4 days by recording the number of infected wounds on each fruit
- Sporulation inhibition fruit was evaluated using a rating scale (1-6) after 10 days



Results

Single fungicide: Protective control





Results

Single fungicide: Protective control



AZX



FLU



PYR



IMZ

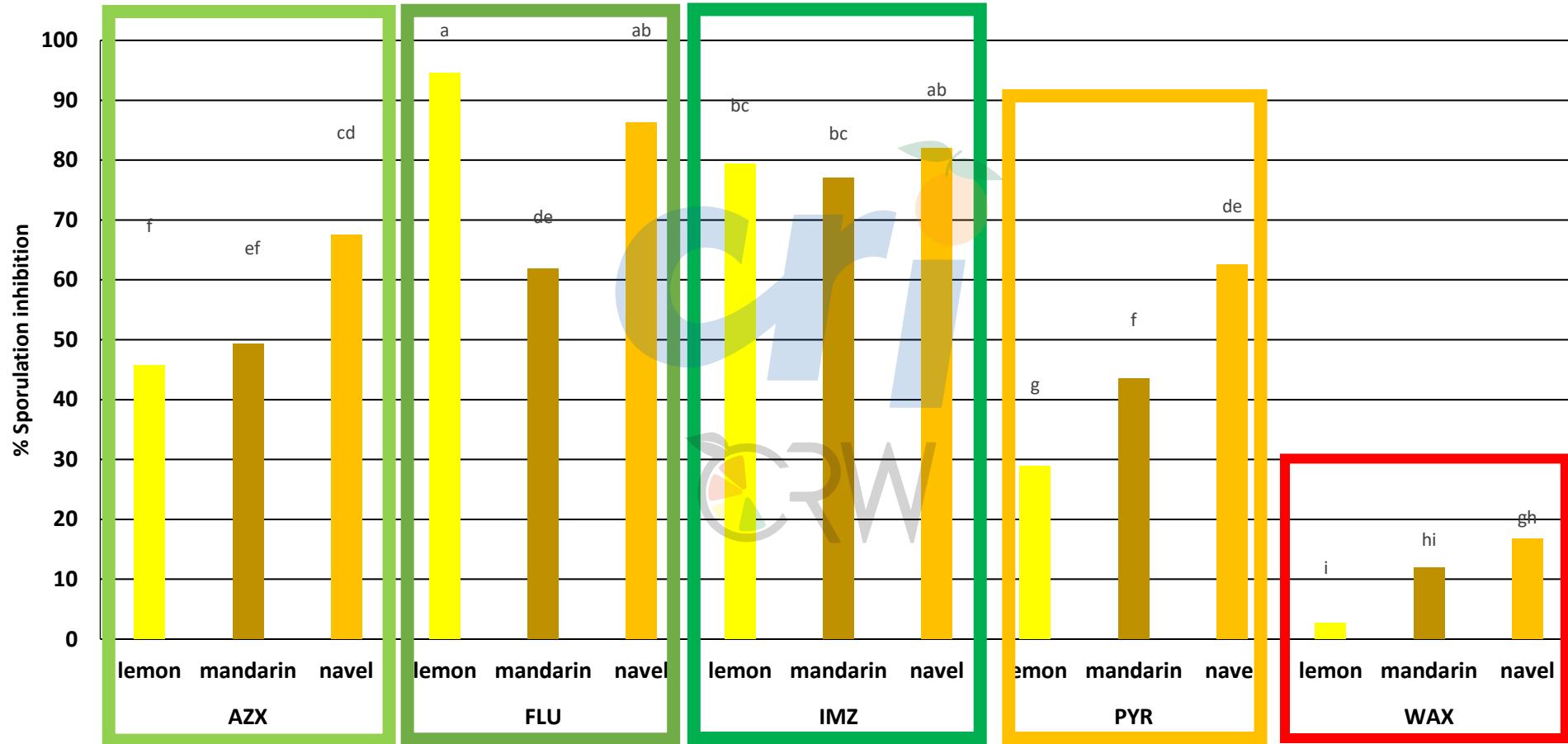


WAX ONLY



Results

Single fungicide: Sporulation inhibition





Results

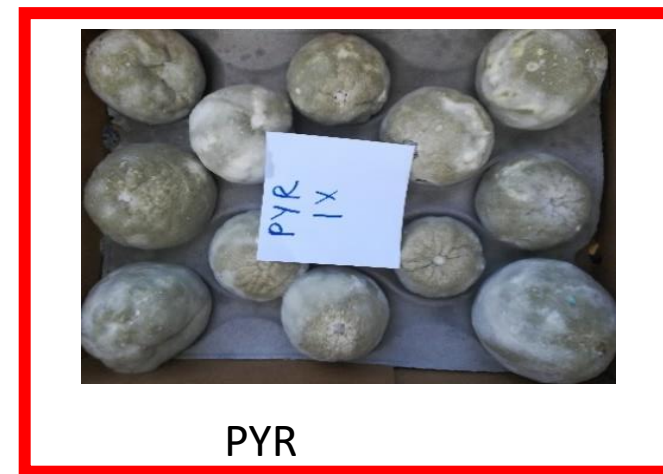
Single fungicides: Sporulation inhibition



AZX



FLU



PYR



IMZ

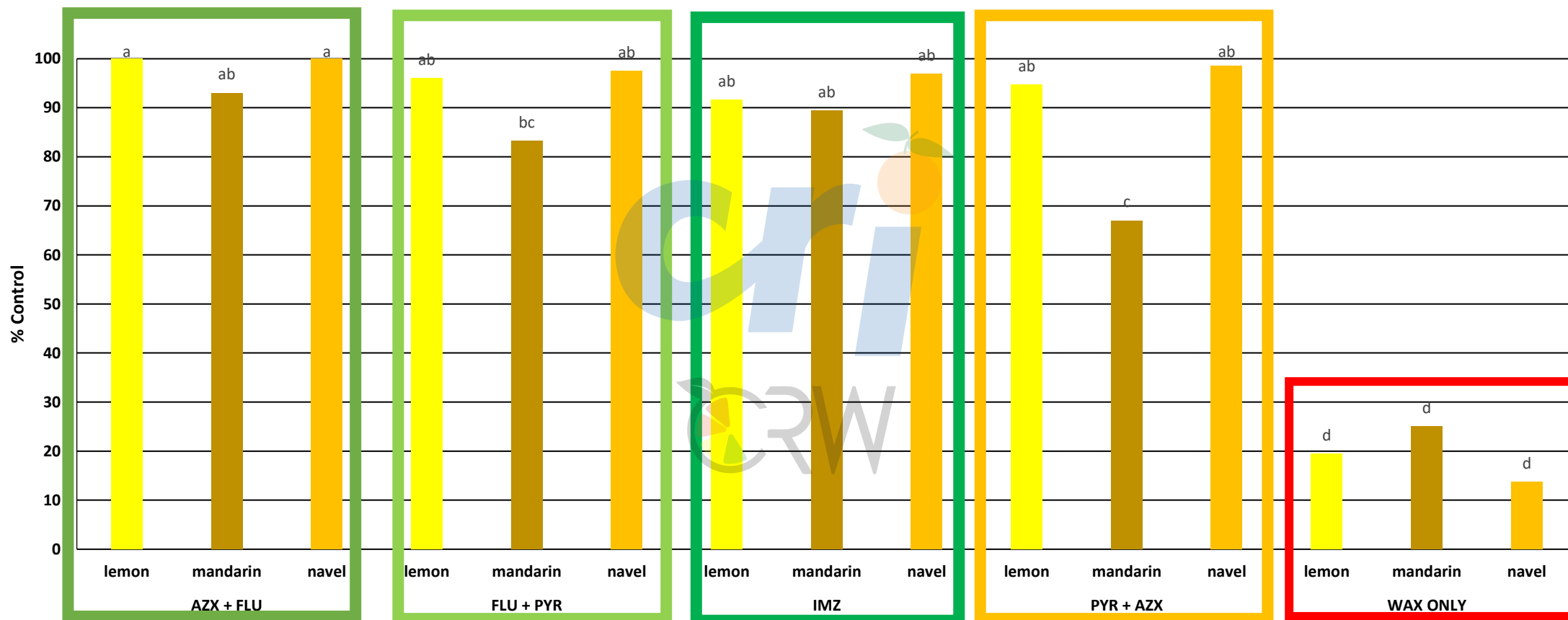


WAX ONLY



Results

Combination fungicides: Protective control





Results

Combination fungicides: Protective control



AZX + FLU



FLU + PYR



PYR + AZX



IMZ

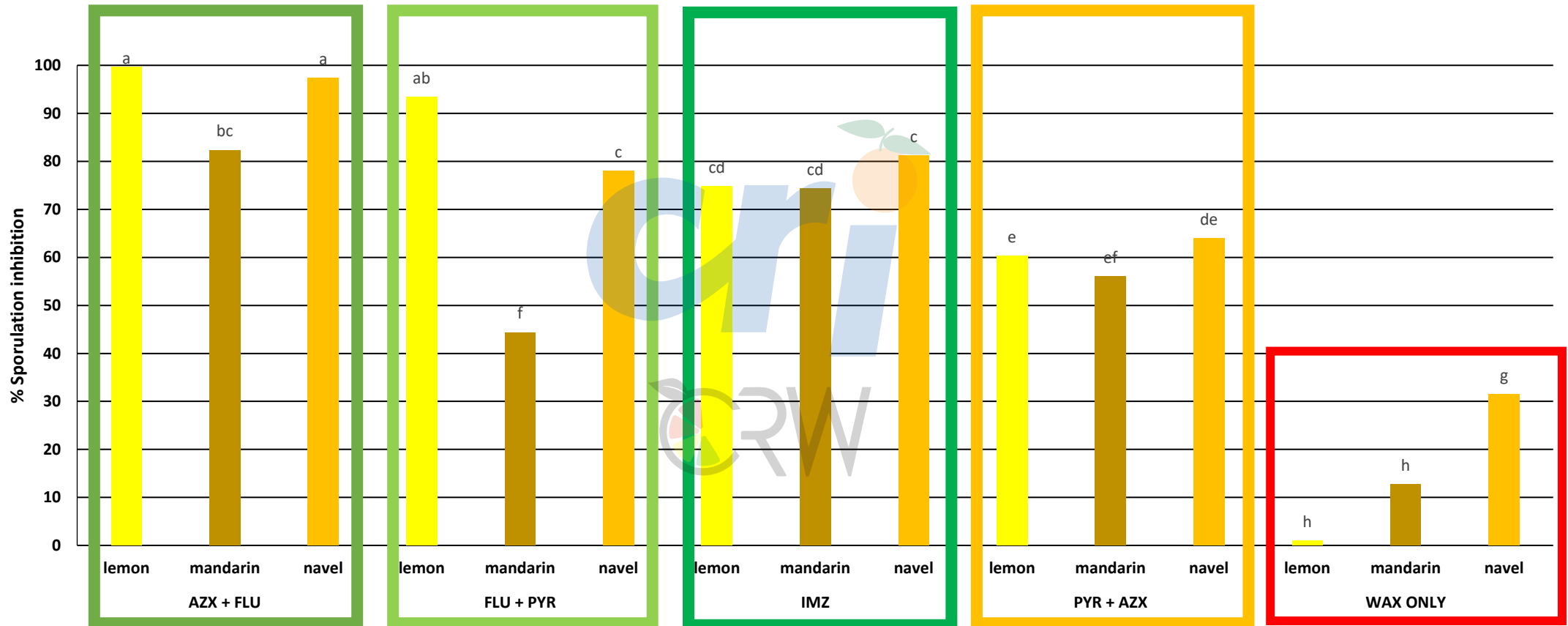


WAX ONLY



Results

Combination fungicides: Sporulation inhibition





Results

Combination fungicides: Sporulation inhibition



AZX + FLU



FLU + PYR



PYR + AZX



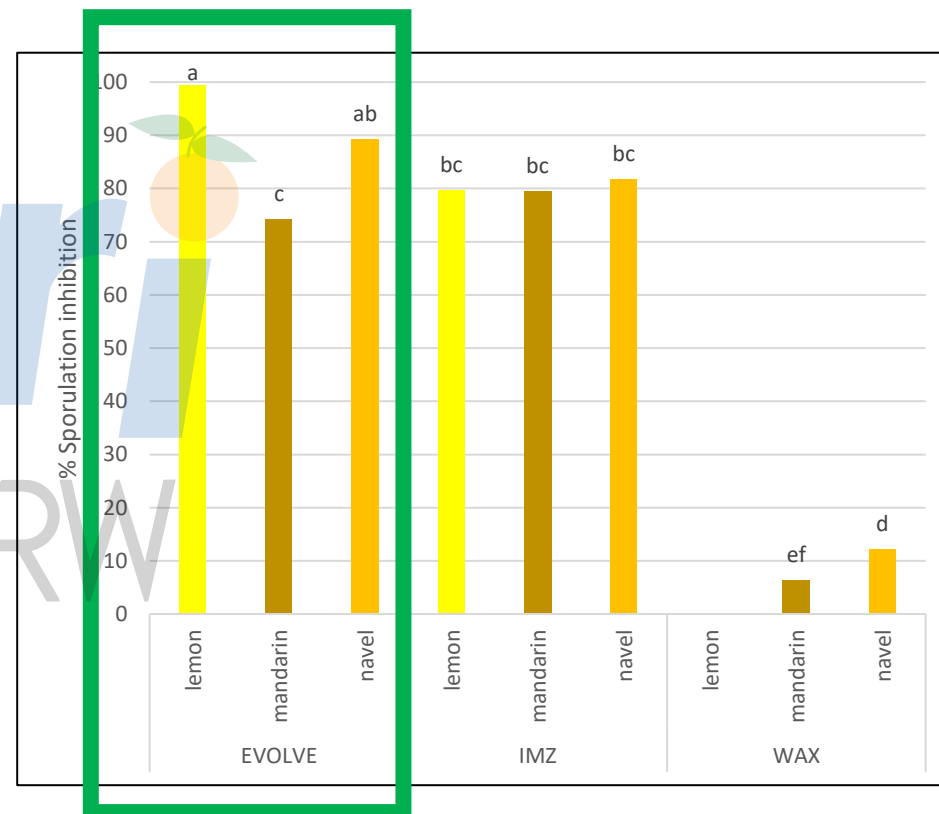
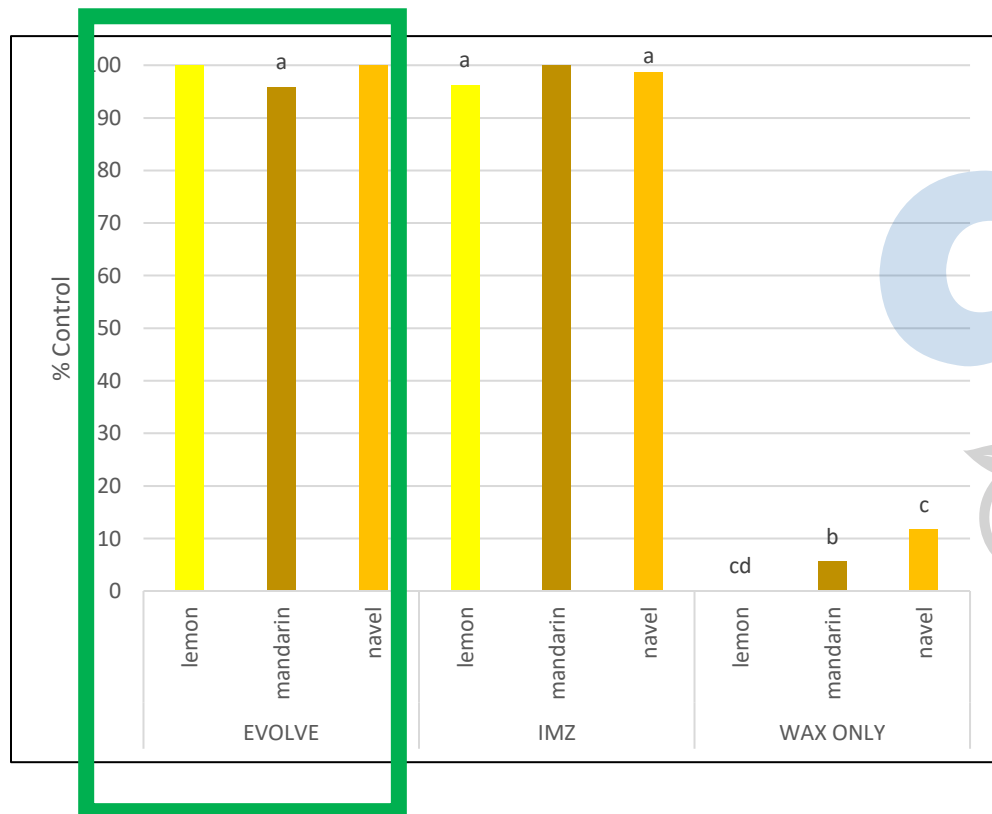
IMZ



WAX ONLY



Results Evolve (AZX + FLU)





Results

	Individual application			Combination application	
	Sporulation inh	Protective cont		Sporulation inh	Protective cont
AZX	GOOD	VERY GOOD	AZX + FLU	VERY GOOD	VERY GOOD
FLU	VERY GOOD	GOOD	FLU + PYR	GOOD	GOOD
PYR	MEDIUM	MEDIUM	PYR + AZX	MEDIUM	MEDIUM
			EVOLVE (AZX + FLU)	VERY GOOD	VERY GOOD



Conclusion

- Three potential alternative fungicides to be used as replacements for imazalil in wax application were tested to determine their protective control action as well as sporulation inhibition potential
- Azoxystrobin performed best with a high protective control action at registered concentration on citrus, while sporulation was largely inhibited at the registered concentration of this fungicide
- For combination fungicide treatments azoxystrobin + fludioxonil performed the best for both protective control as well as sporulation inhibition
- Pyrimethanil gave the lowest protective control and sporulation inhibition



Acknowledgments



Dr. Cheryl Lennox

Dr. Jan van Niekerk

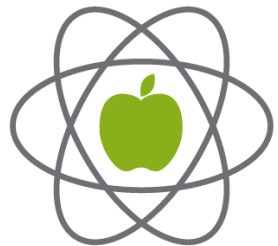
Department of Plant Pathology staff and students - SU



UNIVERSITEIT
iYUNIVESITHI
STELLENBOSCH
UNIVERSITY

100
1918 · 2018

saam vorentoe · masiye phambili · forward together



POST-HARVEST
INNOVATION PROGRAMME

a public-private partnership between



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

fpéf
SOUTH AFRICA
FRESH PRODUCE
EXPORTERS' FORUM

