CONTROL SYSTEMS

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NELSPRUIT

1200

PRE-DEGREENING DRENCH MIXTURE

Per 1000ℓ water

- 2.0ℓ Tecto 500 (1000 ppm)
- 1.0ℓ Tecto 500 (500 ppm) – **CAPE AREAS ONLY** OR
- 1.0 Benlate (500 ppm)
- 500g Benlate (250ppm) – **CAPE AREAS ONLY**
- 2.5ℓ Deccotine }
  2.4ℓ Citricure } Guazatine (500 ppm)
  2.4ℓ Ultracure }
- 10ℓ Deccomone (2.4-D NaSalt) (250 ppm)
- 2.2ℓ Activate Harvest Wash PLUS
- 100mℓ Non-ionic wetter (Citowett, Triton B-1956, Triton AG-98, L-77, Agral 90, etc.) OR
- 1ℓ Sporekill (1000 ppm product) – no wetting agent required

PRE-DEGREENING DRENCH MIXTURE

Drench makeup

1. Firstly add Benlate or Tecto mix thoroughly
2. Add Deccomone and mix
3. Add Sanitizing agent and/or wetting agent and mix
4. Lastly add Deccotine or Citricure or Ultracure and mix well

TOP UP – PRE-DEGREENING DRENCH

Per 1000ℓ water

1. Use up the entire drench and then make up a new mixture of fungicides for 1000ℓ (preferred method).
2. Use half of mixture (500ℓ) and determine how many crates or tons of fruit used up 500ℓ. Now top up as follows:

1 x 500ℓ		+	½ x		Top-up / 500ℓ
Tecto 500 OR	1ℓ	+	500mℓ	=	1.5ℓ
Benlate	500mℓ	+	250mℓ	=	750mℓ
Deccotine OR	1.25ℓ	+	0.625ℓ	=	± 1.9ℓ
Citricure	1.2ℓ	+	0.600ℓ	=	1.8ℓ
Deccomone (2.4-D)	5ℓ	+	2.5ℓ	=	7.5ℓ
Harvest Wash	1.1ℓ	+	0.55ℓ	=	± 1.7ℓ
Wetter OR Sporekill	500mℓ	+	250mℓ	=	750mℓ

TOP UP – PRE-DEGREENING DRENCH Cont.

Add 500ℓ clean water to remaining 500ℓ + fungicides in the drench and then add the amounts in the last column above.

In this way one can top-up after every "X" tons of fruit or after "X" number of trailers or bins of fruit.

We recommend a top-up of 1½ x concentration to compensate for the amount of fungicide stripped out by the fruit.

PACKHOUSE PRECAUTIONS
SANITATION

Chlorine HTH powder	Chlorine Generator - tablets
Active 75-100ppm DPD Available 150-200 ppm Lovibond	Delivers 200 ppm of free available chlorine
pH (acidity or alkalinity) Ideal at 7.0	pH Ideal at 7.0
<7.0 rapid loss of gaseous chlorine	Adjust pH with Citric acid, HCl } High pH
>9.0 stable but less active	Na_2CO_3, NaOH } Low pH
Reactive with organic matter Corrosive	Reactive with organic matter Non-corrosive Advantage over HTH PDR Automatic dosage at required concentration Better managerment

PACKHOUSE PRECAUTIONS
SANITATION

Chlorine Dioxide	Sporekill Quarternary Ammonium compound
20-30 ppm activated ClO_2	1 litre/1000 litre water (1000 ppm product)
Minimal pH Limitation	Not pH dependable
Not necessary to adjust	Dual role Sanitizing and fungicidal properties
ClO_2 very flighty, i.e. rapid loss out of aerated system	
Reactive with organic matter	Reactive with organic matter
Non-corrosive	
	NB QAC's will 'burn' sensitive fruit if left in 1000 ppm solution for 4 hrs+ or if exposed to higher than recommended concentration

POST-HARVEST FUNGICIDES

Fungicides	Organisms controlled
Imazalil (Fungazil, Sanazil, Magnate)	• Penicillium moulds • *Diplodia,* Phomopsis Trichoderma, Anthracnose
Guazatine (Deccotine, Deccowax, Citricure	• Sour rot and Rhizopus • Penicillium moulds • Diplodia, Phomopsis and *Alternaria*
Thiabendazole (Tecto 500)	• Diplodia and Phomopsis • Anthracnose, Fusarium and Trichoderma
Sodium – 2,4D (Deccomone) Salt	Prevents button abscission
• Major activity • Minor activity	

WASTE CONTROL

	Fungicide bath	Wax
Option 1	Imazalil Sulphate (750 WSP)	Deccowax (incl. Guazatine) plus Deccomone (2,4-D) & Tecto 500
Option 2	Imazalil sulphate (750 WSP) plus Deccomone (2,4-D)	Deccowax (incl. Guazatine) plus Tecto 500
Option 3	Imazalil Sulphate (750 WSP) plus Deccotine or Citricure (Guazatine)	Other wax (Dormas, Castle, etc.) plus Deccomone (2,4-D) plus Tecto 500
Option 4	Imazalil Sulphate (750 WSP) plus Deccotine or Citricure (Guazatine) plus Deccomone (2,4-D)	Other wax (Dormas, Castle, etc.) plus Tecto 500

WASTE CONTROL

Refer to the packhouse guide for the correct concentrations. Packhouses using Imazalil on its own in the fungicide bath (Option 1) must monitor the concentration and top up the bath when necessary. Packhouses using Option 2 can also monitor the Imazalil concentration (Titration test) in the presence of Deccomone (2,4-D). Packhouses using options 3 & 4 must determine their own topping up procedures. The recommended topping up rates for the compounds are:

Imazalil Sulphate	:	5g/TON fruit
Deccotine (Guazatine)	:	40ml/TON fruit
Deccomone (2,4-D)	:	40ml/TON fruit

WASTE CONTROL

We recommend to top up after ± 60 tons of fruit (big packhouse). Small packhouses should top up at least once a day. Each packhouse needs to determine this procedure for themselves depending on their daily production tonnage.

Packhouses NOT using Tecto for factory fruit can increase the Imazalil Sulphate concentration to 750-1000 ppm and apply a double application of Deccomone (2,4-D); one in the fungicide bath and one in the wax; not both together.

NB: It is advisable to use Tecto 500 on export fruit during a high waste season

It is in the interests of each packhouse to manage their treatments correctly and diligently at all times

OPTOP VAN SWAMDODER BAD

VOORBEELD ALLEENLIK

1. 60 Ton vrugte daagliks deur paklyn
2. Topop na elke 30 ton vrugte / twee maal per dag
3. Bepaal hoeveel water uit die bad verloor is na 30 ton vrugte
4. Argumentsonthalwe 100 liter
5. Swamdoderbad 2000 liter

VOLG VOLGENDE STAPPE

A. OPMAAK VAN SWAMDODER BAD – 2000 LITER

Imazalil Sulfaat		-	1.3kg (500 dpm)
Guazatine	Deccotine	-	10.0ℓ (1000 dpm)
	Citricure	-	9.6ℓ (1000 dpm)
	Ultracure	-	9.6ℓ (1000 dpm)

Deccomone (2.4-D Natrium Sout) – 40.0ℓ (500 dpm)

B. OPTOP VAN SWAMDODERBAD / 100ℓ WATER VERLOOR NA 30 TON VRUGTE

(MAAK OP TOT VOLLE STERKTE)

Imazalil Sulfaat	-	65g
Guazatine	-	500mℓ of 480mℓ
Deccomone	-	2.0ℓ

C. OPTOP HOEVEELHEDE VIR ELKE SWAMDODER / TON VRUGTE

5g Imazalil	=	5g x 30T	=	150g
40mℓ Guazatine	=	40mℓ x 30T	=	1200mℓ
40mℓ Deccomone	=	40mℓ x 30T	=	1200mℓ

Vul nou 100ℓ water aan in swamdoderbad saam met die hoeveelhede swamdoders in B en C.

PACKHOUSE ETHREL TREATMENTS

1. DIP TREATMENT **Local market only**

Per 100ℓ water

- **625mℓ Ethrel (Lemons, Grapefruit, Clementines) - 3000 ppm**
- **840mℓ Ethrel (Oranges) - 4000 ppm**

+

250mℓ Deccotine or 240mℓ Citricure – 500 ppm

+

10mℓ Agral 90

***NB* Store fruit at 20°C or higher for 24-36 hours.**

WET ETHREL TREATED FRUIT INTO HTH = PHYTOTOXICITY

PACKHOUSE ETHREL TREATMENTS

1. **BRUSH ON (SPRAY ON) TOTAL LOSS – EXPORT FRUIT**

Per 25ℓ water

- **156mℓEthrel (Lemons, Grapefruit, Clementines) - 3000 ppm**
- **210mℓ Ethrel (Oranges) – 4000 ppm**

+

2.5mℓ Agral 90

NB **FRUIT MUST BE DRY BEFORE WAXING**

PRE-HARVEST FUNGICIDE APPLICATIONS FOR POST-HARVEST DECAY CONTROL

***Phytophthora* brown rot**

- Devastating during seasons of high rainfall

Prevention

- Skirt trees
- Do not pack fallen fruit. Fallen fruit indication of infection
- To prevent infected fruit reaching the packhouse, spray fungicides ± 3 weeks before harvest. Repeat if heavy rainfall after application

PRE-HARVEST FUNGICIDE APPLICATIONS FOR POST-HARVEST DECAY CONTROL

Aliette	**250g / 100ℓ water**
Phytex	**1ℓ / 100ℓ water (low volume spray 1800ℓ / ha)**
	700mℓ/100ℓ water (medium volume spray 2500ℓ/ha)
	500mℓ/100 ℓ water (high volume spray 3500ℓ/ha)
Dithane	**200g/100ℓ**
Mikal M	**450g/100ℓ**
Copper fungicides	**Refer Production Guidelines Vol III**

PRE-HARVEST FUNGICIDE APPLICATIONS FOR POST-HARVEST DECAY CONTROL

<u>*Alternaria* navel end rot and black core rot</u>

- **Spores survive from season to season on dead material in the orchard and then sporulate to infect the flower tissue**
- **Pathogen becomes latent or quiescent in calyx tissue or in navel end until infection develops. Can also infect through injuries**

<u>Prevention</u>

- **Good and proper cultural practices**
- **Pre-harvest spray programme**

1. **<u>Folicur EC (250g/ℓ)</u>**

   80mℓ / 100 ℓ

2. **<u>Score EC (250g/ ℓ)</u>**

   50m ℓ / 100 ℓ

   Apply at 50% and again at 100% petal fall

NEW DEVELOPMENTS

POST-HARVEST PATHOLOGY

Registrations

Citriwax - ICA laboratories

Wouter Schreuder (082 450 9757)

UltraCure (Guazatine) – Hyper Agrochem

Gert van Zyl (082 823 1027)

Sporekill – Citrus Packhouse dumptanks

2.4-D Amine and Ester

Not for fungicide baths

Not registered

NEW DEVELOPMENTS (Cont.)

POST-HARVEST PATHOLOGY

Penicillium resistance to Imazalil

Resistant spores detected

Wax issue

6 Suppliers of waxes – impurities

Chlorine and Chlorine dioxide (Harvest Wash) generators

Andrew Buchan 082 337 0138

Hugh Mitchell 082 853 1177

SUPPLIERS OF CITRUS WAXES

Spanish waxes

Formesa	-	Parquad Engineering
Citrosol	-	H.G. Molenaar

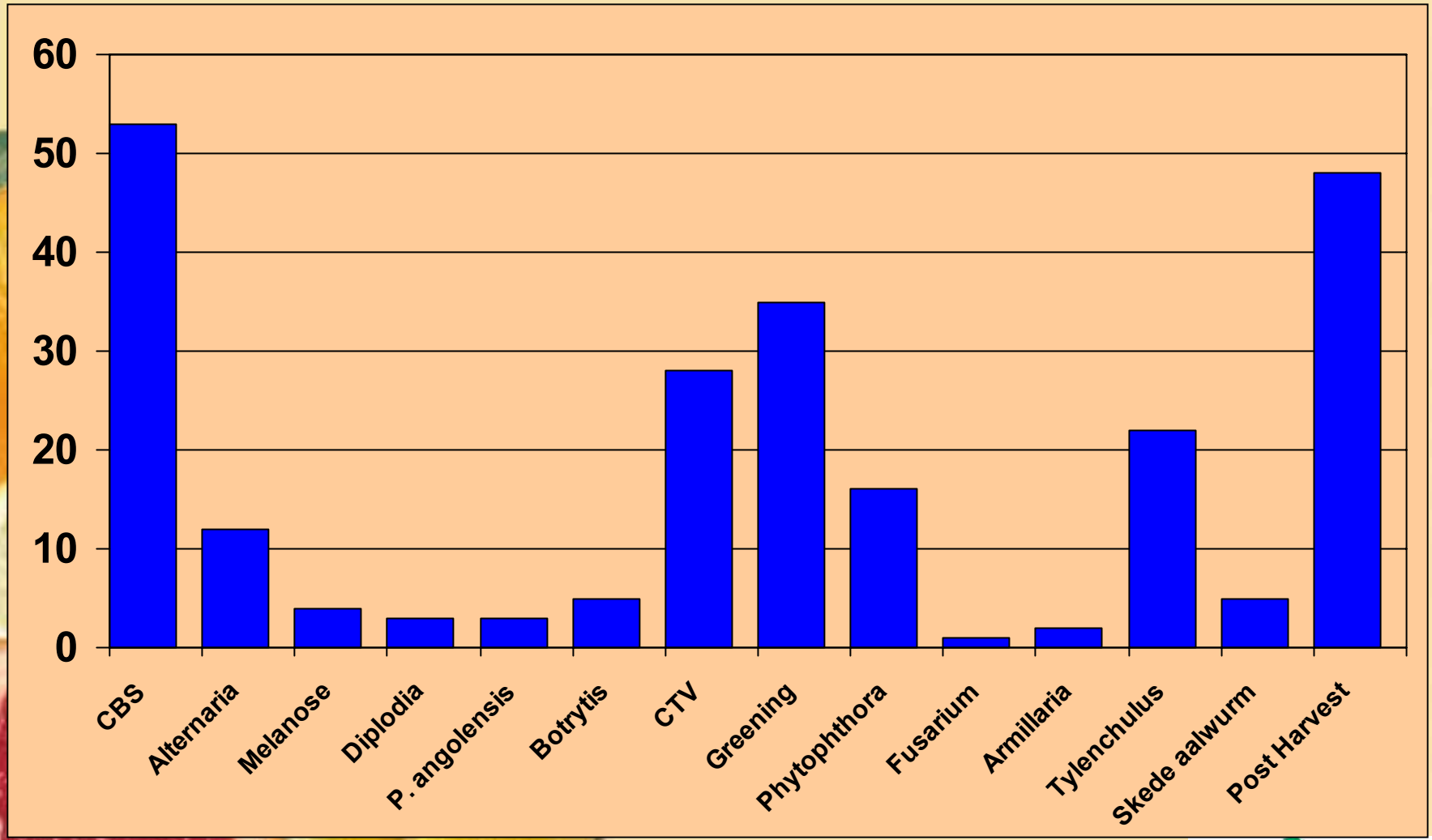
Argentinian waxes

Novon	-	Gerard Meyer

Other waxes

Castle	-	Sasol Schumann
Citrashine	-	Citrashine – Dormas
FMC	-	BTC Products

RELATIVE IMPORTANCE OF POST-HARVEST RESEARCH TO OTHER DISEASE MANAGEMENT PROBLEMS



POST-HARVEST - RESEARCH REQUESTS	APPRO-VAL
Evaluation of new waxes	T
Evaluation of new chemicals	T
Evaluation of new surfactants	T
Development of alternative strategies to prevent resistance using GRAS chemicals	T
Development of alternative strategies to prevent resistance using biocontrol agents	T
Development of alternative strategies to prevent resistance using physical treatments	T
Use of phosphonates, i.e. Phytex, as post-harvest dip to prevent brown rot	T

POST-HARVEST - RESEARCH REQUESTS	APPRO-VAL
Post-package fumigation to eliminate phytosanitary pests	T
Prevention of decay resulting from degreening	X
Post-Harvest Strategies for organic citrus	T
Registrations of generic imazalil + Tecto + guazatine	T
Explain poor appearance of waxes on SA fruit compared to USA fruit	Extension
Development strategies for fungicide resistance in packhouses	T
Effect of humidity control on post-harvest decay in packhouses	X
Prevention of sour rot	T Extension

EXAMPLES OF RESEARCH DURING 2002

- Evaluation of biocontrol agent
- Evaluation of several sanitizing agents
- Evaluation of generic fungicides – Imazalil and Guazatine
- Evaluation of new citrus waxes
- S.A. Citrus wax issue – regulation
- Evaluation of Israeli compound and other phosphonates for post-harvest control of *Phytophthora* brown rot
- Search for chemicals (Quats) for use on "Chemfree" fruit and status of such chemicals in specific markets (Japan, etc.)
- Chlorine generators
- Fungicide resistance screening (30-40 samples)
- GRAS chemicals for CBS control (Post-harvest)
- Spanish waxes – Pilot trial
- Mini packhouse line
- Cold chain work
  - Chilling injury and waxes

SIMPLIFIED MRL's FOR POST-HARVEST CITRUS FUNGICIDES				
	EUROPE	U S A	CANADA	JAPAN
Imazalil	5.0	10.0	5.0	5.0
Guazatine	5.0	-	-	-*
Thiabendazole	5.0	10.0	10.0	10.0
SOPP	10.0	10.0	10.0	10.0
Carbendazim (including Benlate)	10.0	10.0	10.0	10.0
2.4-D	2.0	5.0	2.0	2.0
*1.0 PPM Pre-packhouse (pre-degreening drench only)				