

## POST-HARVEST DISEASES

### Pre-Packhouse and Packhouse Treatment Recommendations for 2014

by  
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#### Pre-Packhouse treatment recommendations

##### Degreening

The ideal place for citrus rind colour to develop fully is on the tree. However, certain factors such as changes in internal fruit quality (drop in the solid content (Brix) whilst the fruit is still green), environmental conditions (little difference between the day and night temperatures to induce colour development), packing volumes and schedules, and market demand, make this unachievable. Therefore it justifies the implementation of a colour improvement strategy by the producer/packhouse. Degreening is part of this strategy. The aim of degreening is thus to reduce the time a producer has to wait for internally mature fruit to reach an acceptable colour for packing.

All packhouses that degreen citrus fruit must have a pre-packline drenching system where the fruit is treated with a mixture of compounds to protect the fruit against postharvest diseases during

degreening. Currently, there is a trend for non-degreening packhouses to also use pre-packline drenching as part of their strategy to combat postharvest diseases more effectively, especially where there is a delay between harvesting and treatment of the fruit in the packhouse. However, the drench application is suboptimal, compared to the dip application in the packhouse, and therefore requires diligent management. Experience and knowledge of the different fungicides and diseases has prompted the recommendation of the most effective mixture of compounds for the pre-packline drenches.

#### Fruit to be drenched would include the following:

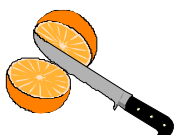
- Fruit for degreening
- Where there is a delay of more than 24 hours from harvesting to packhouse treatments
- Citrus cultivars that are more susceptible to decay (Soft citrus and navel oranges)

**NB: PRE-DEGREENING DRENCH SYSTEMS MUST BE UPGRADED TO DELIVER A MINIMUM OF 250 L DRENCH MIXTURE / BIN / MINUTE**

#### Pre-degreening drench mixture recommended:

PER 1000 ℓ WATER	ACTIVE INGREDIENT	PATHOGENS INHIBITED
<b>Only one of the following TBZ formulations</b> <ul style="list-style-type: none"> <li>➤ 2.0 ℓ Tecto</li> <li>➤ 2.0 ℓ ICA Thiabendazole</li> <li>➤ 2.0 ℓ Universal Thiabendazole</li> <li>➤ 2.0 ℓ Thiazole</li> </ul>	<b>TBZ (1000 ppm)</b>	<b>The latent pathogens Anthracnose, Diplodia and Phomopsis stem-end rot</b>
<b>Only one of the following guazatine formulations</b> <ul style="list-style-type: none"> <li>➤ 5 ℓ Deccotine</li> <li>➤ 5 ℓ Kenopel</li> <li>➤ 4,8 ℓ CitriCure</li> </ul>	<b>Guazatine (1000 ppm)</b>	<b>Sour rot and Green and Blue mould</b>
<b>2,4-D</b> <ul style="list-style-type: none"> <li>➤ 10 ℓ 2,4-D Sodium salt (Deccomone or Calyfix)</li> </ul>	<b>2,4-D (250 ppm)</b>	<b>Maintains live, non-abscised buttons (calyx)</b>
<b>2.5 ℓ Protector (pyrimethanil)</b>	<b>Pyrimethanil (1000 ppm)</b>	<b>Imazalil-sensitive and -resistant Penicillium spore populations</b>

**CRI DOES NOT RECOMMEND THE USE OF IMAZALIL IN THE DRENCH MIXTURE**



<b>Reservoir size</b>	1000 L	Discard drench mix after 60 tons of fruit or 150 bins
	2000 L	Discard drench mix after 80 tons of fruit or 200 bins
	3000 L	Discard drench mix after 120 tons of fruit or 300 bins
<b>Flow rate</b>	1 bin	250 L per minute
	2 bin stack	500 L per minute
	3 bin stack	750 L per minute
<b>Exposure time</b>	per stack	1 to 3 minutes

## Packhouse treatment recommendations

### Fruit washing systems

Due to the high load of postharvest fungal spores and organic matter on the surface of citrus fruit, the fruit must be washed and sanitised in one or both of two types of washing systems; a wet dump into a water tank washing system and/or a dry dump into a spray-on washing system over a bed of brushes. Both systems need to be sanitised by the use of chlorine for the purpose of killing the fungal spores thereby firstly preventing the washing systems from becoming a source of inoculum for possible infection of injured fruit moving through the system, and secondly, for preventing a carry-over of fungal spores into the fungicide treatment systems in the packhouse.

The chlorine is delivered into the washing systems by one of two chlorine generation systems, i.e. a Buccaneer generator or Chip doser. The effective activity of chlorine against fungal spores depends on the concentration of free active chlorine, time of exposure and pH (acidity or alkalinity) of the solution. The free active chlorine must be maintained at a concentration of 75-100 ppm and the pH must be adjusted to 6.5 - 7.5, and ORP (Oxidation Reduction Potential) must be measured at >650 mV.

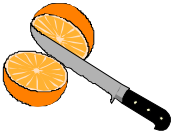
### Hot water fungicide bath

1. Temperature: 30-35°C
2. Imazalil 750 WSP or WG at a concentration of 500 ppm (670 g /1000 l); or Imazalil 750 WSP or WG plus guazatine 200 SL or 210 SL at a concentration of 1000 ppm (5.0 l /1000 l or 4.8 l /1000 l) for:
  - Packhouses not drenching.
  - To reduce the risk of sour rot infections.
  - Resistance strategy.
3. Top up to the recommended concentration in the bath of
  - 500 ppm imazalil and 1000 ppm guazatine.
  - plus 5 g imazalil/ton fruit and 40 ml guazatine/ton fruit.
4. Titrate for imazalil and/or guazatine to check the concentration levels

### Wax application

Fungicides applied in the wax:

1. Imazalil 500EC: 150 ml / 25 l wax (3000ppm) – **standard registered application** alone in the wax; or 100 ml / 25 l wax (2000ppm) – **double application:** in the wax and in the 500 ppm bath application
2. Thiabendazole (TBZ) 500SC: 200 ml / 25 l wax (4000 ppm)
3. 2,4-D Na salt (Deccomone): 250 ml / 25 l wax (250 ppm)
4. Guazatine (3000 ppm) formulated waxes (Deccowax or Citriwax)



## NA-OES SIEKTES

### Voor-Pakhuis en Pakhuisbehandeling Aanbevelings vir 2014

deur

Keith Lesar and Arno Erasmus (CRI)

#### Voor-pakhuis behandeling aanbevelings

##### Ontgroening

Die ideale plek vir die ten volle opkleur van sitrusvrugte is terwyl die vrugte aan die boom hang. Nietemin, sekere toestande soos veranderinge in interne vrug gehalte (vaste stowwe/Brix wat te vinnig daal terwyl vrugte nie opkleur nie), omgewingstoestande (te min verskil in die dag en nag temperature om die vrugte behoorlik te laat opkleur), verpakking volumes en skedule, en mark aanvraag laat dit nie toe nie. Dit regverdig dus die implementering van 'n vrugkleur verbetering strategie deur die produsent/pakhuis. Ontgroening is deel van hierdie strategie. Die doel van ontgroening is dus om die tyd te verminder wat 'n produsent moet wag voor vrugte, met optimum interne gehalte, 'n aanvaarbare kleur voor verpakking bereik het.

Alle pakhuis, wat sitrusvrugte ontgroen, moet gebruik maak van 'n voor-pakhuis storting stelsel ("drench") waarin die vrugte met 'n mengsel van chemikalieë behandel word om die vrugte teen na-oes siektes, tydens ontgroening, te beskerm.

Huidiglik gebruik al meer pakhuis, wat nie ontgroen nie, ook 'n voor-pakhuis storting as deel van hulle strategie om na-oes siektes beter te beheer, veral waar daar 'n vertraging tussen pluk en behandeling van die vrugte in die pakhuis is.

Die storting stelsel is nietemin suboptimaal, in vergelyking met die doopaanwending in die pakhuis, en verg dus noukeurige bestuur. Ondervinding en kennis van die verskillende swamdoders en die siektes gee aanleiding tot die aanbeveling van die mees doeltreffende mengsel van chemikalieë in die voor-pakhuis storting stelsels.

#### Vrugte vir storting ("drenching") sluit die volgende in:

- Vrugte vir ontgroening
- Waar daar 'n vertraging van langer as 24 uur tussen pluk en pakhuis behandelings is
- Sitrus kultivars wat meer vatbaar vir bederf is (Sagte sitrus en nawel lemoene)

**LET WEL: VOOR-ONTGROENING STORTING STELSELS MOET OPGEGRADER WORD OM 'n MINIMUM VAN 250 L STORTING MENGSEL / KRAT / MINUUT AF TE LEWER**

**Aanbevole voor-ontgroening storting ("drench") mengsel:**

PER 1000 l WATER	AKTIEWE BESTANDDEEL	PATOGENE GEINHIBEER
Een van die volgende TBZ formulasies <ul style="list-style-type: none"> <li>➤ 2.0 l Tecto</li> <li>➤ 2.0 l ICA Thiabendazole</li> <li>➤ 2.0 l Universal Thiabendazole</li> <li>➤ 2.0 l Thiazole</li> </ul>	TBZ (1000 dpm)	Die latentepatogene Anthracnose, Diplodia en Phomopsis stingelent vrot
Een van die volgende guazatine formulasies <ul style="list-style-type: none"> <li>➤ 5 l Deccotine</li> <li>➤ 5 l Kenopel</li> <li>➤ 4,8 l CitriCure</li> </ul>	Guazatine (1000 dpm)	Suurvrot en Groen en Blouskimmel
2,4-D <ul style="list-style-type: none"> <li>➤ 10 l 2,4-D Natrium sout (Deccomone of Calyfix)</li> </ul>	2,4-D (250 dpm)	Behou lewendige blomkelke en verhoed afval van blomkelke
2.5 l Protector (pyrimethanil)	Pyrimethanil (1000 ppm)	Imazalil- sensitiewe en - bestande Penicillium spoor populasies

**CRI BEVEEL NIE DIE GEBRUIK VAN IMAZALIL IN THE STORTING MENGSEL NIE**

**JOU HEFFING WERK VIR JOU – PRODUSENTE SE HEFFINGS WORD AANGEWEND OM DIE AKTIWITEITE VAN DIE CRI TE BEFONDS**



<b>Reservoir grootte</b>	1000 L	Verwyder stort-mengsel na 60 ton vrugte of 150 kratte
	2000 L	Verwyder stort-mengsel na 80 ton vrugte of 200 kratte
	3000 L	Verwyder stort-mengsel na 120 ton vrugte of 300 kratte
<b>Vloei Tempo</b>	1 krat	250 L per minuut
	2 krat stapel	500 L per minuut
	3 krat stapel	750 L per minuut
<b>Blootstelling tyd</b>		1 to 3 minute

## Pakhuisbehandeling aanbevelings

### Vrugwas stelsels

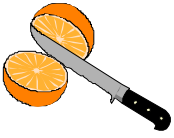
As gevolg van die hoë na-oes swamspoorlading en organiesestowwe op die oppervlakte van sitrusvrugte, moet die vrugte in een of albei van twee tipes vrugwas stelsels gewas en ontsmet word. nl., natdompel in 'n water dompeltenkstelsel en/of droogdompel in 'n aanspuitstelsel oor 'n stel borsels. Albei stelsels moet, deur die gebruik van chloor, ontsmet word om die swamspore dood te maak en daardeur eerstens te verhoed dat die stelsels 'n bron van inokulum word en die moontlike besmetting van beseerde vrugte in die stelsel veroorsaak, en tweedens, om die

moontlike oordrag van swamspore in die swamdoder behandeling stelsels in die pakhuis te voorkom.

Die chloor word in die vrugwas stelsels toegedien deur die gebruik van twee chloorgenerator stelsels, nl. 'n "Buccaneer" generator of 'n "Chip" doseerder. Die effektiewe werking van chloor teen die swamspore hang af van die konsentrasie van die vrye aktiewe chloor, die tyd van blootstelling en pH (suurgehalte of alkaligehalte) van die oplossing. Die vrye aktiewe chloor moet teen 'n konsentrasie van 75-100dpm gehandhaaf word, die pH moet teen 6.5 – 7.5 aangepas word en die ORP ("Oxydation Reduction Potential") moet >650 mV wees.

### Warmwater Swamdoderbad

1. Temperatuur: 30-35°C
2. Imazalil 750 WSP of WG teen 'n konsentrasie van 500 dpm (670 g /1000 l); of Imazalil 750 WSP of WG plus guazatine 200 SL of 210 SL teen 'n konsentrasie van 1000 dpm (5.0 l /1000 l of 4.8 l /1000 l) vir:
  - Pakhuise wat nie stort ("drench") nie
  - Om die risiko van suurvrot besmettings te verminder
  - Teen-bestandheid strategie
3. Aanvulling teen volle konsentrasie in die bad
  - 500 dpm imazalil en 1000 dpm guazatine
  - plus 5 g imazalil /ton vrugte en 40 ml guazatine/ton vrugte
4. Titreer vir imazalil en/of guazatine om die konsentrasie vlakke na te gaan.



## Waksaanwending

Swamdoders wat in die waks aangewend word:

1. Imazalil 500EC: 150 ml / 25 l waks (3000 dpm) – **standaard geregistreerde aanwending**  
of  
100 ml / 25 l waks (2000 dpm) – **dubbelaanwending:** in die waks en die 500 ppm  
badaanwending
2. Thiabendazole (TBZ) 500SC: 200 ml / 25 l waks (4000 dpm)
3. 2,4-D Na sout (Deccomone): 250 ml / 25 l waks (250 dpm)
4. Guazatine (3000 dpm) geformuleerde wakse (Deccowax or Citriwax)