



Managing Phytophthora brown rot following pre-harvest rain

Jan van Niekerk, M.C. Pretorius and Andre Combrink
Citrus Research International (CRI)

Widespread rainfall recently occurred in many production areas. Many orchards are, therefore, wet, and the soils are potentially waterlogged. These wet conditions will enhance the chances of Phytophthora brown rot occurring on fruit, and also increase the risk of root rot development. These wet weather conditions, therefore, necessitate action, and the following control measures should be taken. This Cutting Edge outlines recommendations on actions that should be taken.

Management in the orchard

1. Sanitation

- a. All visibly decaying fruit should be removed, at least once a week from the orchard, from now onwards and especially **PRIOR TO HARVEST**. These fruit not only harbours inoculum for Phytophthora brown rot infections, but also for other postharvest pathogens.
- b. It is therefore important that, **ON THE DAY OF HARVEST**, a sanitation team moves ahead of the harvesting team to remove all visibly decayed fruit, which should not end up in harvest bins or go to the packhouse or near export fruit. **ANY INFECTED FRUIT THAT LANDS IN AN EXPORT CARTON WILL CAUSE BROWN ROT IN THE CARTON AND ALSO PROMOTE THE DEVELOPMENT OF SECONDARY DECAY CAUSED BY OTHER POSTHARVEST PATHOGENS.**

2. Skirt trees

- a. Low-hanging fruit, fruit touching the ground, or those covered in mud are at high risk of developing Phytophthora brown rot due to contact with the soil, where the *Phytophthora* spp. causing brown rot occurs.
- b. If trees are skirted low or not skirted at all, do not export the skirt fruit (up to 1.0 m above the orchard floor) as they are at **HIGH RISK** of decay developing during transit. The brown rot that develops during transit will spread in the carton and also lead to the development of secondary *Penicillium* decay.

- c. It is therefore better to remove low-hanging fruit but **it should not be placed** into bins with fruit destined for export.
- d. Care should be taken when using equipment to collect picking bins in the orchard (e.g. the 'Krokodil'), as this apparatus often collects soil when picking up the bins. The soil harbours *Phytophthora* spores and can be a source of inoculum.

Chemical management options

1. The **contact fungicides** copper (200 g/ 100 L) or and mancozeb (200 g/ 100L) are registered as a preventative measures against Phytophthora brown rot. As always, follow label recommendations closely and familiarise yourself with market restrictions, pre-harvest intervals (PHI's), and maximum residue limits (MRL's) of the product used.
2. **Systemic products**, like the phosphonates, **rather than a contact fungicide, could be considered**. Several phosphonate products are registered for the control of brown rot. The registered **foliar applications** for the control of root and collar rot will also be effective against brown rot. Phosphonates are systemic products and will protect fruit from re-infestation. **At all times, adhere to the label instructions and pre-harvest intervals (PHI).**
3. **Soil drenches and stem applications with phosphonates DO NOT control Phytophthora brown rot.**
4. Care must be taken when spraying soft citrus with phosphonates after colour break as phytotoxicity damage can occur (Cutting Edge 218).

Postharvest management

Postharvest management of Brown rot should be seen as supporting the orchard management actions taken.

1. Packhouse sanitation

- a. Regular, daily cleaning and sanitation of the pack line are important to remove any pathogen inoculum that might be present on a regular basis during the day. Sanitation of the floor and packing line should include removal of any remaining fruit and debris.
- b. Visibly decayed fruit that have accidentally been picked accidentally, or



that comes out of degreening should be **sorted out on the pre-sorting line** to prevent these fruit from entering the packhouse or pack line.

- c. All rotten fruit that has been graded out must be removed from the packhouse as soon as possible – this includes juice/factory bin fruit.
- d. Recirculating systems – especially the drench and tip water – must be sanitised/changed regularly as *Phytophthora* spp. Brown rot and other postharvest pathogen spores from the orchard will accumulate in the water with prolonged use. Peracetic acids (PAAs) are compatible with our aqueous fungicides, but check the concentration often – it dissipates over time and can burn the fruit if too high. Calcium hypochlorite (chlorine) can be used in systems where fungicides are not added, such as the wash or high- pressure spray.
- e. Harvest bins should be washed, sanitised and rinsed well before being sent back into the orchard. It is especially important to remove any soil that adheres to the bins as this can also harbour soilborne pathogens such as *Phytophthora* spp. causing Brown rot

2. Postharvest fungicides

Azoxystrobin (450 ml/100L water; 1125 ppm) are is registered to be applied as a postharvest aqueous dip or drench treatment for the control of *Phytophthora* brown rot.



Bestuur van *Phytophthora*-bruinvrot ná voor-oes reën

Jan van Niekerk, M.C. Pretorius en Andre
Combrink
Citrus Research International (CRI)

Wydverspreide reënval en oorstromings het onlangs in baie produksiegebiede voorgekom. Boorde was, of is steeds, onder water en in sommige boorde is die gronde nog versuip. Hierdie nat toestande sal die kanse van *Phytophthora*-bruinvrot wat op vrugte voorkom, en wortelvrot, verhoog. Hierdie nat weerstoestande benodig dus drastiese optrede, en dringende beheermaatreëls moet getref word. Hierdie Snykant dien as 'n waarskuwing aan alle produsente wat dit nog nie gedoen het nie, om onmiddellik op te tree. Dit skets ook aanbevelings oor aksies wat geneem moet word.

Bestuur in die boord

1. Sanitasie

- a. Alle sigbaar verrotte vrugte moet van nou af ten minste een keer 'n week, uit die boord verwyder word, en veral **VOOR-OES**. Hierdie vrugte bevat nie net inokulum vir *Phytophthora*-bruinvrot-infeksies nie, maar ook van ander na-oes patogene.
- b. Dit is dus belangrik dat, **OP DIE OESDAG**, 'n sanitasiespan vóór die oesspan beweeg om alle sigbaar verrotte vrugte te verwyder wat nie in plukkratte moet beland nie, of na die pakhuis gaan, of naby uitvoervrugte kom nie. **ENIGE GEÏNFEKTEERDE VRUGTE WAT IN 'N UITVOERKARTON BELAND, SAL BRUINVROT IN DIE KARTON VEROORSAAK EN OOK DIE ONTWIKKELING VAN SEKONDÊRE VRUGVROT AANHELP WAT DEUR ANDER NA-OES PATOGENE VEROORSAAK WORD.**

2. Soomsnoei van bome

- a. Laaghangende vrugte, vrugte wat die grond raak of dié wat met modder bedek is, loop 'n hoë risiko om *Phytophthora*-bruinvrot te ontwikkel as gevolg van kontak met die grond waar die *Phytophthora* spp. wat bruinvrot veroorsaak, voorkom.
- b. As bome laag of glad nie gesoomsnoei is nie, moenie die laagliggende vrugte (tot 1.0 m bokant die boordvloer) uitvoer nie (tot 1.0 m bokant die boordvloer)

aangesien dit 'n **hoë risiko** loop om tydens uitvoer bederf te ontwikkel. Die Bruinvrot wat tydens uitvoer ontwikkel, sal in die karton versprei en ook tot die ontwikkeling van sekondêre *Penicillium*-bederf lei.

- c. Dit is dus beter om laaghangende vrugte te verwyder, maar **dit moet nie in houters met vrugte wat vir uitvoer bestem is, gesit word nie.**
- d. Sorg moet gedra word wanneer toerusting gebruik word om plukhouders in die boord te versamel (bv. die 'Krokodil'), aangesien hierdie aparate dikwels grond versamel wanneer die houters opgetel word. Die grond huisves *Phytophthora*-spore en kan 'n bron van inokulum wees.

Chemiese bestuurs-opsies

1. Die **kontakswamdoders** koper (200 g/ 100 L) en mankoseb (200 g/ 100L) is geregistreer as 'n voorkomende maatreël teen **Phytophthora-bruinvrot**. Volg die etiket-aanbevelings getrou en wees vertrouwd met markbepelings, voor-oes intervale (PHI's) en maksimum residu limiete (MRL'e) van die produk wat gebruik word.
2. Met die huidige situasie moet **sistemiese produkte**, soos die fosfonate, **eerder as 'n kontak swamdoder**, oorweeg word. Verskeie fosfonaatprodukte is geregistreer vir die beheer van Bruinvrot. Die geregistreerde **blaartoedienings** vir die beheer van wortel- en kraagvrot sal ook effektief teen Bruinvrot wees. Fosfonate is sistemiese produkte en sal vrugte teen herbesmetting beskerm. **Volg te alle tye die etiket-instruksies en vooroes-intervalle (PHI).**
3. **Grondrenkings en stamtoedienings met fosfonate beheer nie Phytophthora-bruinvrot nie.**
4. Wees versigtig om sagte sitrus met fosfonate ná kleurbreek te spuit aangesien fitotoksiese skade kan voorkom (Snykant 218).

Na-oesbestuur

Na-oesbestuur van Bruinvrot moet gesien word as 'n ondersteuning van die boordbestuurs-aksies wat geneem is.

1. Pakhuissanitasie

- a. Gereelde, daaglikse skoonmaak en sanitasie van die paklyn op 'n gereelde basis deur die dag, is belangrik om enige patogeen-inokulum wat teenwoordig kan wees, te verwyder. Sanitasie van

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



die vloer en paklyn moet die verwydering van vrugte en afval insluit.

b. Sigbaar verrotte vrugte wat per ongeluk gepluk is of wat uit ontgroening kom, **moet op die voorafsorteerlyn uitgesorteer word** om te verhoed dat hierdie vrugte die pakhuis/paklyn binnegaan.

c. Alle vrot vrugte wat uitgegradeer is, moet so gou moontlik uit die pakhuis verwyder word – dit sluit sap/fabriek houervrugte in.

d. Hersirkulasiestelsels – veral die doop- en stortwater – moet gereeld ontsmet/verander word aangesien *Phytophthora* spp. Bruinvrot en ander na-oes patogeenspore van die boord, met langdurige gebruik, in die water sal opbou, met langdurige gebruik. Perasynsure (PAA's) is verenigbaar met ons wateroplosbare swamdoders, maar kyk gereeld na die konsentrasie – dit breek mettertyd af en kan die vrugte brand as die konsentrasie te hoog is. Kalsiumhipochloriet (chloor) kan gebruik word in stelsels waar swamdoders nie bygevoeg word nie, soos die was- of hoëdrukspuit.

e. Oeshouers moet gewas, ontsmet en goed afgespoel word voordat dit teruggestuur word na die boord. Dit is veral belangrik om enige grond wat aan die houers kleef, te verwyder, aangesien dit ook grondgedraagde patogene soos die *Phytophthora* spp. wat Bruinvrot veroorsaak, kan huisves.

2. Na-oes swamdoders

Asoksistrobien (450 ml/100L water; 1125 ppm) is geregistreer om as 'n na-oes behandeling in 'n wateroplossing, toegedien te word vir die beheer van *Phytophthora* Bruinvrot.