EXTENSION BRIEFS FOR APRIL & MAY 2014

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INTEGRATED PEST MANAGEMENT

T G GROUT, S D MOORE & A MANRAKHAN

Phytosanitary pests

All the recommendations made in the Extension Briefs for February and March also apply to this period. Monitoring numbers of fruit flies and false codling moth (FCM) is critical. Remember that for Medfly, the threshold in a Capilure baited trap is 4 males per week whilst for Natal fly, the threshold in a Capilure baited trap is 2 males per week. When using Questlure in a Sensus trap, the threshold is one female fly per trap per week for both Medfly and Natal fly. If these thresholds are exceeded, control actions must be increased. Surveillance monitoring of the invasive fruit fly, *Bactrocera invadens (B.i.)* per Production Unit Code (PUC) is a requirement for phytosanitary registration of citrus for export to special markets. Surveillance monitoring should be carried out weekly. Trap details and trap servicing should be recorded as per trapping guidelines (http://www.citrusres.com/market-access). *Bactrocera invadens* is considered present in the Vhembe district, Limpopo Province, and was detected in isolated areas in other districts of Limpopo, Mpumalanga and KwaZulu-Natal Provinces. Where *B.i.* is present or was detected, growers should manage the pest by applying protein bait sprays or bait stations in combination with methyl-eugenol based Male Annihilation Technique (MAT) (e.g Invader-b-Lok, *B.i.* . Toolkit, Static Spinosad ME, Last call *B.i.* .). Growers should take measures to ensure that fruit moved out of affected production areas are not infested with *B.i.* Growers in the Vhembe district should apply for a removal permit if fruit is to be moved out of the district. In areas where *B.i.* was detected (outside of Vhembe district), growers would be served with quarantine orders from DAFF and should adhere to the instructions on the orders, including the application for a removal permit to move fruit out of the affected areas.

Growers are urged to be diligent about weekly monitoring of fruit drop under 5-10 data trees in each orchard, particularly those most susceptible to FCM. This entails careful dissection of fruit and inspection for FCM larvae, tunnelling and frass (amongst all other causes of fruit drop). Although this should be done weekly from around December, it is particularly important in the last few weeks leading up to harvest as this is a very good indicator of the post-harvest risk posed by fruit harvested from the orchard. This could play a key role in deciding whether fruit is suitable for certain sensitive markets or not. Sanitation of split, stung or infested fruit in the trees, or fallen fruit on the ground, should take place at least once a week. Packhouses are strongly urged to implement inspections for FCM as proposed within the Systems Approach communicated in Cutting Edge 155 of April 2013. This Cutting Edge must be consulted for details on how to implement the system.

Blemish factor analysis

The analysis of fruit blemish factors on the tree just prior to harvest or once fruit have been harvested, provides the grower with an evaluation in commercial terms, of all control programmes implemented during the season and also assists with pest management decisions for the season to follow. With the trend towards selective picking and a variable degree of culling occurring in the orchard, it is more accurate to conduct the final analysis of fruit blemish factors before picking starts. Care must be taken to include fruit from inside the tree and all blemish factors or pest infestations should be recorded, whether they are sufficient to cull the fruit from export quality or not. If fruit blemish is analysed at the packhouse, samples can be taken at a convenient point before the fruit are graded. Samples should be randomly selected and the number of samples should ensure that a true picture is obtained of the situation in a particular orchard. Having taken the sample, it is important to record separately each pest or other blemish factor that is severe enough to downgrade a fruit in its own right. With this procedure a particular fruit in the sample may be shown to have more than one factor that can cause it to be culled from export.

CROP AND FRUIT QUALITY MANAGEMENT

P.J.R CRONJÉ & J.J. BESTER

Maturity indexing

Maturity indexing on early and mid-season cultivars should commence. Maturity indexing is done to predict the rate of change in fruit maturity in order to harvest fruit at a maturity that would maintain acceptable commercial shelf life. The aim is to define changes or rate of change in acids and sugars and to build up a database over a number of years for comparison. Random sampling of fruit every week from each of ten representative trees should start 4 to 6 weeks before the expected harvest date. Titratable acidity is determined by titration with sodium hydroxide, sugar content (Brix) is determined by a refractometer, the sugar:acid ratio calculated and fruit colour should be read from a colour chart. All the parameters mentioned above should be plotted on a graph over time. Once plotted, trends will become apparent, harvest dates can be estimated and problem areas in internal and external quality parameters can be identified and manipulated.

Pruning

Pruning of early cultivars (Satsuma, Clem-

entine) should be done during this period as soon as possible after harvest. Remove all dead wood, broken branches and weak bearing wood. Bring down or maintain the height of the trees, shape the trees for optimum light interception and cut windows into the canopy to ensure optimal light distribution into the canopy to improve internal fruit quality and rind integrity. Prune more heavily after a light crop and if a heavy crop is expected and when the orchard has a history of alternate bearing.

Postharvest foliar urea application

A foliar urea application (low biuret urea at 1%) can be applied on early cultivars (Satsuma, Clementine) as soon after harvest as possible.

GRONDGEDRAAGDE SIEKTES

M C PRETORIUS & JAN VAN NIEKERK

Phytophthora en aalwurmbeheer

Dit is nou 'n goeie tyd van die jaar vir die winterreënval gebiede soos die Wes-Kaap om *Phytophthora* en aalwurmontledings te doen. Beheerprogramme moet 'n aanvang neem na die eerste goeie winterreëns. Beheermaatreëls moet 'n program van minstens twee maar verkieslik drie toedienings (twee maande uitmekaar) insluit. Let op residu-weerhoudingstydperke van veral aalwurmdoders en lees die *etikette* van die verskillende produkte!!!

Phytophthora beheer

Wortel en kraagvrot

Phytophthora wortel en kraagvrot beheerprogramme in die Wes-Kaap kan in die herfs begin. Ridomil wortelsone behandeling (2.1 mℓ/m²) en fosfonaat blaarbespuitings kan gebruik word om wortel en kraagvrot effektief te beheer. Drie fosfonaat toedienings twee maande uitmekaar behoort gedoen te word. Let op weerhoudingstydperke.

Baie belangrik: ***lees die etikette van die verskillende produkte deeglik, veral die waarskuwings!*** Vermy die gebruik van die fosfonate indien toestande voorkom wat bome onder enige vorm van stremming plaas. Produsente het oor die algemeen 'n probleem om te weet wanneer boorde onder vogstremming is en wanneer nie. Bo en behalwe droogte en hitte kan bergwindtoestande ook bome onder tydelike verwelkte toestande plaas wat 'n gevaar inhou vir blaarbespuitings. Bome moet dus nie tydens of kort na sulke toestande gespuit word nie. Laastens beïnvloed drag ook 'n boom se gevoeligheid vir droogtespanning. Hoe hoër die drag, hoe gevoeliger is die boom vir uitdroging en hoe groter is die risiko vir fitotoksisiteit.

Bruinvrot

Herfsreëns kan lei tot ernstige na-oesbederfverliese deur *Phytophthora* bruinvrot. 'n Enkele vrug, wat besmet is met bruinvrot, kan tydens verskeping die res van die vrugte in 'n uitvoerkarton laat bederf teen die tyd wat die vrugte hul bestemming bereik.

In die somerreënval gebiede word bruinvrot op sitrus hoofsaaklik veroorsaak deur die patogeen *Phytophthora nicotianae* var. *parasitica* en affekteer dit meestal die vrugte op die onderste 1.5 m van die boom naaste aan die grondoppervlak. Dit behoort dus redelik veilig te wees om slegs hierdie onderste band vrugte te spuit in boorde waar die *Phytophthora* insidensie nie hoog is nie. In die winterreënval gebiede kom *Phytophthora citrophthora* ook voor. Hierdie patogeen versprei hoër op in die boom en kan vrugte tot bo in 'n sitrusboom besmet. Daar word dus aanbeveel dat die totale blaaroppervlak in hierdie streke gespuit sal word. Bruinvrot ontwikkel slegs wanneer die klimaatstoestande gunstig is vir die patogeen *(Phytophthora)* om te infekteer en te ontwikkel. Indien dit dus 'n droë najaar is en geen of slegs ligte reënbuitjies voorkom, is voorkomende bespuitings nie nodig nie. Indien dit egter 'n nat winter of najaar is, moet bome gespuit word. Kontak swandoders soos Koper (200 g/100 ℓ) of mancozeb (200 g/100 ℓ) kan gespuit word om bruinvrot te beheer. Daar is egter beperkinge tov mancozeb binne sekere markte. Beide hierdie produkte is slegs kontakmiddels en die moontlikheid dat dit afgewas kan word deur reën en besproeiing is moontlik. Daar is ook 'n gevaar dat indien die kopertoedienings en proteïen vrugtevliegvlieglokase te na aan mekaar toegedien word fitotosisiteit (stippeling) op die skille kan voorkom. Hierdie gevaar is hoër tydens kleurbreek. *Sistemiese fosfonaat swammiddels is uiters effektief vir die beheer van bruinvrot, Fighter en Brilliant is geregistreer vir die gebruik teen bruinvrot. Die fosfonate is ook effektief teen bruinvrot indien dit in 'n wortelvrot program gebruik word as 'n blaarbespuiting. Geeneen van die fosfonaat stamaanwendings is effektief teen bruinvrot nie.*

WATERBESTUUR/ WATER MANAGEMENT

J T VAHRMEIJER

Besproeiingskedulering/ Irrigation scheduling

Mature citrus trees require between 7 000 and 10 000 m³ water per hectare per year. Water is lost through evaporation, run-off, leaching and transpiration. Transpiration and in some instances leaching are beneficial to the trees and therefore not viewed as a loss. However, non-beneficial losses should be kept to a minimum. Evaporation is largely determined by climatic factors such as radiation, temperature, humidity and wind. Run-off is determined by infiltration rate, slope and application rate. Non-beneficial leaching occurs when water penetrates to below the root zone.

Evaporasie kan verminder word deur te verseker dat druplyne bo-op riwwe vasgemaak is om te verhoed dat water teen die kante van riwwe afloop. Sodoende word die oppervlakte verminder waarvan water kan verdamp. Die grondoppervlak kan ook met

organiese materiaal bedek word om verdamping te verminder. Afloop kan verder beperk word deur seker te maak dat die toedieningstempo van die besproeiingswater nie hoër is as die infiltrasietempo van die grond nie. Die periode van besproeiing moet genoegsaam wees om die wortelsone tot veldkapasiteit te benat sonder om die wortelsone te versadig en sodoende oormaat dreinering of afloop te veroorsaak. Die instandhouding van besproeiingstoerusting is belangrik om te verseker dat die toerusting in 'n goeie toestand is en dat daar geen lekkasies, is nie.

The difference between field capacity and the actual soil water content is called the "soil water depletion". Irrigation timing and the amount of water to be applied are determined by monitoring or estimating soil water depletion and applying water when the depletion reaches a pre-selected level, called the management allowable depletion.

Grondvogsensors wat die grondwaterinhoud meet, is waarskynlik 'n beter aanduiding vir "wanneer" en "hoeveel" besproei moet word as die gebruik van gewasfaktore of die sogenaamde kalendermetode, waar besproeiing op 'n voorafbepaalde tyd plaasvind, bv. elke Dinsdag en Vrydag.

Tensiometers

Tensiometers are installed in pairs. The ceramic cup of the first tensiometer must be in the root zone and the second cup should be below the root zone. For most soils the reading should be between -5 to -20 kPa at field water capacity. No tensiometer should remain on zero or even at -5 kPa for too long as this is an indication of water saturated conditions. As the soil dries out, the tension slowly increases (readings become more negative) until a certain inflection point is reached. This point is characteristic of the soil and lies between -30 and -70 kPa. The tension increases rapidly after the inflection point has been reached.

For sandy soils irrigation should probably commence already at a tension of -30 kPa and in a clay soil at -40 to -50 kPa. However, it is important to note that these values are characteristic of the soil and should be determined for each irrigation block.

Irrigation is scheduled according to the readings of the shallow tensiometer. The deeper placed tensiometer monitors over and under-irrigation. If the deeper placed tensiometer continuously gives a low reading then over-irrigation is indicated. However, if it gives increasingly higher readings, in spite of irrigation, it indicates under-irrigation.

Kapasitans "probes"

Kapasitans "probes" meet op verskillende dieptes die relatiewe waterinhoud van die grond. Hierdie metings geskied op 'n kontinue basis (elke 30 of 60 min). Die sagteware maak voorsiening dat 'n versadigingspunt, 'n hervulpunt en droë punt gekies kan word. Indien die grafiek daal tot by die hervulpunt kan met besproeiing begin word. In gronde met 'n hoë klei-inhoud is dit moeiliker om die verandering in die waterinhoud van die grond waar te neem.

Profielput

'n Profielput in die wortelsone van die bome kan weekliks of selfs twee-weekliks gegrawe word. Die waterinhoud van die grond word dan visueel waargeneem en die besproeiingskedulering word daarvolgens beplan. Die voordeel van hierdie metode is dat probleemareas geïdentifiseer en geïnspekteer kan word.

POSTHARVEST PATHOLOGY-WASTE PREVENTION CHECKLIST

K H LESAR, A ERASMUS & P H FOURIE

Waste Control

Essential points to remember

High humidity, rainfall and temperatures create an environment that is suitable for waste development. However, the mere occurrence of the above does not necessarily mean that there will be higher waste. Other factors or conditions are necessary. These include injuries (mechanical, fruit fly stings, FCM, etc.) as well as the presence of decay-causing organisms (pathogens) in the orchard, packhouse and picking bins.

The disease triangle

Since the pathogen, the host (fruit) and the environment are invariably related, they can be grouped into three basic components which are illustrated in the form of a 'disease triangle'. The elimination of one or more of the components of the disease triangle results in a situation where waste (the disease) cannot develop.

Although we have no control over the environmental factors, we definitely have control over the presence of the pathogen and the susceptibility of the fruit to waste. Below are some points to take heed of:

Pathogen: Keep inoculum to an absolute minimum.

- Regular sanitation (this is not only important to keep the spore load down, but is also necessary for reducing fruit fly and FCM levels).
- Disinfection of dump tanks (check regularly and keep records of concentrations).
- Post-harvest fungicides (regular checks/records).
- Disinfection of packhouses, trailers, picking bins, etc. Following hard surface disinfection, rinse surfaces with clean water to remove any possible disinfectant residues.

The fruit: Our most important rots develop from injuries.

- Minimise picking injuries (producers should use the indigo carmine test to identify which of the pickers are not handling the fruit carefully enough).
- *Train contract pickers to handle fruit correctly.* Indications are that the substantial

waste over the last number of seasons was due to high numbers of injuries. *NB!!*

- Spray for *Phytophthora* brown rot.
- Control fruit fly and FCM. The main types of decay found in cartons are green mould and sour rot. This type of waste is mainly caused by injuries made by fruit fly and FCM, as well as picking and handling injuries.
- Minimise any delay between picking and treatments in the packhouse.
- Prevent over-maturity.
- Prevent build-up of latent pathogen (Diplodia, Anthracnose and Phomopsis) inoculum by removing dead wood in trees regularly through the season.
- Sanitation of dropped or stung fruit at least once a week.

How safe is your descaler and dumptank water? A simple method to check whether your descaler and/or dumptank water is a source of fungal contamination.

- Place 30 uninjured fruit from a picking trailer into a large bucket containing a 1% Jik solution.
- After washing the fruit place the fruit carefully into a clean citrus carton to dry (away from any place where surface contamination of fruit with spores can take place).
- Make an instrument to injure the fruit. It is recommended that you push a nail through a cork so that the sharp end of the nail extends 2 mm from the end of the cork. Sterilise this instrument in Jik.
- Injure all 30 fruit by scraping the instrument across the fruit (2-3 mm long) and penetrating the rind.
- Randomly select 15 of the injured fruit and place them into a paper bag for your control treatment.
- Measure the concentration of your sanitising agent in the descaler water prior to putting the injured fruit through the system.

Treat the remaining 15 fruit (one at a time) by holding each fruit for 3 seconds under the high pressure spray of the descaler. Allow this fruit to dry in a clean carton and place into a paper bag.

- Make sure that both paper bags are tightly sealed so that no vinegar flies can contaminate the injuries.

Place the two bags in a room at ambient temperature (no air-conditioning), and check on the situation 5-7 days later. If the control has no waste and the treated fruit has lots of waste then you need to carefully check on your descaler sanitation process.

This exercise/check should also be done on the dump tank washing system.

Citrus Packhouse Sanitation

NB: Important to remember for packhouse sanitation and fungicide resistance

- Do not allow partly decomposed fruit or decomposed fruit with visible spores into the packhouse.
- If decomposed fruit is found in the packing bins or on grading tables the whole line must be disinfected.
- Culled fruit, especially fungicide-treated fruit, must not be left in or near the packhouse.
- Fungicide-treated local market fruit must not be stored in or around the packhouse and allowed to decay and develop spores.
- Spores on fungicide-treated fruit are highly likely to contain a large proportion of spores resistant to that fungicide. If these resistant spores are allowed to spread back into the packhouse, this situation could be conducive to the development of full-scale resistance to a fungicide.
- The packhouse and pack line must be cleaned and disinfected every day, after packing.

It is important to understand how sanitisers complement the use of fungicides and the reality of what sanitisers can and cannot do.

The difference between fungicides and sanitisers

Fungicides only kill specific fungi. Sanitisers are non-specific and will kill not only fungi but bacteria as well. Fungicides will kill fungi over a prolonged period, whereas sanitisers will only kill fungi or bacteria on contact. Fungicides bind to fruit surfaces and give some residual protection to the fruit preventing latent infections and infection of wounds after treatment. Unlike fungicides, sanitisers are highly reactive and once inactivated will no longer offer any residual protection. Sanitisers react not only with fungi and bacteria but also with dirt, leaves, twigs and even with fruit surfaces, so the greater the amount of organic matter the quicker the sanitiser will lose its activity.

Sanitisers, therefore, cannot prevent mould from developing on infected fruit, but can effectively limit the build-up of fungal and bacterial spores in dump tanks and high-pressure spray fruit washing systems. This is done by sanitising the water and preventing spores washing onto clean fruit or into wounds on clean fruit.

Effective use of any sanitiser requires a reliable, approved test kit (no dipsticks) to be able to read and monitor the sanitiser concentration in a washing system, and maintain the sanitiser concentration at the correct recommended concentration, as the washing system becomes dirtier. As stated above, the more the build-up of organic material and spores, the greater the demand on the sanitiser and the less effective the sanitiser will be. Therefore it is necessary to maintain a fairly clean washing system and monitor the product concentration for the washing system to be effective.

Manage the efficacy of your chlorine application

The majority of packhouses have a chlorine application in some form or another. The purpose of this application is to surface steri-

lise the fruit to kill any spores coming from the orchard or degreening rooms. The spores can cause future infections en route to the market. When a chlorine product is added to the water it reacts with the water to form hypochlorous acid (HOCL). Depending on the solution pH, more HOCL or less species will be formed. If the pH is too high, less HOCL is formed and other less effective chlorine species will be present. This means that the chlorine concentration may be measured and found to be at the correct level, but the main chlorine species is not HOCL. To measure the efficacy of a chlorine solution the oxidation reduction potential (ORP) should be determined. This can be done by using any of the many user-friendly handheld ORP probes available on the market. There are probes that can measure temperature, pH and ORP without any problem of changing probes. A good chemical representative should be able to find one suitable for packhouse use.

The procedure to measure the efficacy of a chlorine solution should be as follows:

1. Measure ORP – should be >650 mV
2. If ORP is too low, measure pH and concentration
3. pH should be 6 – 7
4. Concentration should be 75 – 100 ppm

The best practice for packhouses should be to make use of a continuous, automatic chlorine dosing system. Packhouses in areas with hard water (high alkalinity) should consider installing an automatic acid dosing system. These systems are affordable and are crucial to ensure effective sanitation of the fruit.

Drenching

During this time of the season many packhouses are now in full production. Packhouses are urged not to neglect the drenching system even though work pressure may be high. The efficacy of the drenching system relies heavily on the cleanliness of the system and, most importantly, the time delay from harvest to treatment. This delay should not be longer than 24 hours. The kick-back action of fungicides declines rapidly after 24 hours and treatment following longer delays will have limited effect and may just turn out to be wasting precious time and money.