

INTEGRATED PEST MANAGEMENT

S.D. MOORE

Mealybug

Growers should be scouting for mealybug regularly, by inspecting underneath calyxes and thereby determining percentage of fruit infested. The most effective way of doing this is to break the fruit off from the calyx. Both the fruit and the underside of the calyx should then be inspected. Where mealybug is under good biocontrol, infestation should peak during December in the northern production areas and during January in the Cape production areas. If mealybug infestation does not decline during January and February, respectively, suppression with a chemical treatment is advisable on early maturing cultivars. Trial results have demonstrated that buprofezin (Applaud) is by far the most effective corrective option for mealybug control. However, it is imperative that any application of buprofezin be targeted against the younger stages of mealybug i.e. eggs, crawlers and second instars.

This is also a good time to determine which species of mealybug are present. This is important, as it appears that the biocontrol complexes of oleander mealybug and longtailed mealybug, in particular, might not be as effective as that of citrus mealybug. Therefore, treatments can be applied more easily when either of these species are identified as the dominant species in a particular orchard. The phytosanitary status of certain species must also be borne in mind.

T.G. GROUT

Bud mite

The period February to May is the optimal time for bud mite sprays. Bromopropylate is an option to consider for fruit going to all markets except the USA, but take note of the 21-day pre-harvest interval. More than one abamectin application during summer for citrus thrips will suppress bud mite populations but the level of control may not be adequate for lemons.

T.G. GROUT

Fruit fly

Fruit fly monitoring and management practices should be initiated two months before the earliest expected harvest date. Recommendations remain unchanged from those communicated in the Cutting Edge issues 26 and 27 in 2005. Fruit flies should be controlled by use of weekly protein hydrolysate bait sprays, the use of GF120, M3 bait stations or Last Call FF. Traps must be used to indicate whether the control strategy is adequate. Growers have the option of monitoring male flies in Sensus traps with Capilure and using a threshold of 4 flies per week per trap, or using Questlure in a Sensus trap and using a threshold of 1 female fly per week per trap. If these thresholds are exceeded, additional control measures will be required.

BEMESTING EN BESPROEING

J.G.K. COETZEE

Leaf sampling

Leaf analysis, with all its limitations, is still the best method to evaluate the nutritional status of citrus and for that matter any fruit crop. However, to optimise the benefits from leaf analysis, the correct leaf must be sampled.

Die regte blaar beteken die blaar wat dieselfde ouderdom en posisie op die boom het as dié blare wat gebruik is toe die norms of streefwaardes opgestel is. Die regte blaar om by sitrus te monster is die blaar wat agter die vrug op dieselfde stingel gedra word. Indien die blare tussen Februarie en Mei gemonster word, sal hulle 7 tot 9 maande oud wees.

Leaves from other positions will have different composition and cannot be used in the Southern African system where leaves from fruiting terminals are used as the diagnostic leaf.

In 'n vergelykende studie is die samestelling van blare vanaf nie-vrugdraende lote met dié vanaf vrugdraende lote vergelyk. Die konsentrasie van stikstof (N), fosfor (P) en kalium (K) het drasties tussen die twee soorte blare verskil. Feitlik geen verskille ten opsigte van kalsium (Ca) en min by magnesium (Mg) is waargeneem nie.

Make a special effort to ensure that the correct leaf is sampled. Teach the sampler the difference between leaves from fruiting and non-fruiting terminals.

The results are as follows (Embleton *et al*, 1963).

Element	Fruiting terminals	Non-fruiting terminals
N	1,53%	2,36%
P	0,083%	0,128%
K	0,38%	0,86%
Ca	3,92%	3,52%
Mg	0,349%	0,250%

Remember:

- No laboratory instrument can improve the quality of the sample.
- Sample the same group of trees every year (Index trees).
- Take the sample at the same time, say second half of March, every year.

Onthou dus:

- Bestee tyd aan die neem van blaarmonsters.
- Geen laboratoriumtoerusting kan die kwaliteit van die monster verbeter nie.
- Neem die monsters elke jaar by dieselfde groep bome (Indeks-bome).
- Neem die monsters elke jaar op dieselfde tyd, sê tweede helfte van Maart.

GRONDGEDRAAGDE SIEKTES

M.C. PRETORIUS

Phytophthora bruinvrot

Weens die gevaar van fitotoksiteit op gevoelige sitruskultivars tydens hoë temperature, wat gedurende Februarie / Maart kan voorkom, moet die gebruik van fosfonaatblaarbespuiting streng volgens die etiket geskied. Hoë dagtemperatuur en tydelike vogstremming kan veroorsaak dat fosfonate swart stippeltjies soortgelyk aan koperskade op vrugte veroorsaak. Bome moet daarom nie gespruit word as toestande nie optimaal is nie.

Bruinvrot ontwikkel slegs wanneer die klimaatstoestand gunstig is vir die patoëen (*Phytophthora*) om te infekteer en te ontwikkel. Indien dit dus 'n droë najaar is en geen of slegs ligte reënuitjies kom voor, is voorkomende fosfonaatblaarbespuitings nie nodig nie. Indien dit egter 'n nat na-jaar is moet die bome met óf 'n fosfonaat óf koper óf mancozeb gespruit word om bruinvrot te beheer. Laasgenoemde twee middels is slegs voorkomend terwyl die fosfonate ook 'n korrektiewe werking het. Producent het oor die algemeen 'n probleem om te weet wanneer hulle boorde onder vogstremming is en wanneer nie. 'n Handige instrument bo en behalwe meetinstrumente soos tensiometers is die graaf. Dit is tans beskikbaar by al die voorste koöperasies en hardewarewinkels.

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 gespruit 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 fitotoksiteit. Bly dus weg van fosfonate op Satsumas en ander sagtesitruskultivars wat gestres word om die interne kwaliteit te verhoog.

Sitrusaalgewurm

Wortelmonsters kan enige tyd van die jaar getrek word om die status van die sitrusaalgewurmpopulasies in boorde te bepaal. Wyfietellings word gebruik om te bepaal of die toediening van 'n aalgewurmdoder geregverdig is. Die drempelwaarde voordat 'n aalgewurmdoder oorweeg word is 1000 wyfies/10 g wortels. Weens die droogte-toestande wat tans in die meeste sitrusproduserende areas ervaar word, word die toediening van aalgewurmdoders in die meeste gevalle nie aanbeveel nie. Daar word aanbeveel dat aalgewurmdoder-toedienings 'n aanvang neem tydens die begin van die reënseisoen. Dit sou daarom die regte tyd wees vir producente in die Wes-Kaap om hulle aalgewurmmonsters in Maart te trek sodat hulle weet watter boorde om te behandel wanneer hulle winterreëns begin. Residu-weerhoudingstydperke moet in ag geneem word.

Tydens die toediening van aalgewurmdoders is dit uiters belangrik dat ten minste 40 mm besproeiing toegedien word om te verseker dat die middels in die grondprofiel ingewas word. Met die uitsondering van Temik, loog die meeste ander aalgewur-

doders baie stadig. Die effektiwiteit van die doders word dus belemmer indien hulle nie behoorlik deur die wortelsone versprei word nie.

Indien beplan word om 'n boord te verwyder behoort 'n aalgewurmmonster geneem te word voordat die boord verwyder word sodat bepaal kan word of sitrusaalgewurms teenwoordig is. Dit is nodig as 'n bestuursriglyn tydens 'n herplantstrategie.

CROP LOAD & FRUIT QUALITY ENHANCEMENT

J.S. VERREYNNE & G.H. BARRY

Internal quality: If properly timed, regulated deficit irrigation can result in an increased total soluble solids (TSS) and an increase or no response in titratable acidity. Deficit irrigation retards the breakdown of acid and can result in a more favorable solids:acid ratio at harvest, especially in cultivars where there is a sudden drop in acid before harvest. It is mainly aimed at early cultivars like Satsuma, but other early maturing cultivars with low internal quality could benefit. No water stress should be imposed during the initial growth phase of the fruit, i.e., during and after flowering, but only during the final maturation phase, i.e., the last two months prior to harvest (January for Satsuma). Less water is applied and at longer intervals. Therefore, irrigation is continued but at a reduced level. Trees should be irrigated lightly two weeks prior to harvest. In high rainfall areas, regulated deficit irrigation may not be successful. The deficit should be imposed slowly, so that the trees can adjust without symptoms of drought. Severe water stress can have adverse effects on tree health and fruit quality. High nitrogen is antagonistic to the effect of deficit irrigation. Management of this technique is much easier when trees are planted on ridges. Additionally, regulated deficit irrigation imposed the last two months prior to harvest also enhances the rate of colour development. Selective harvest of outside fruit and delaying harvest of inside fruit will result in a higher proportion of fruit with higher TSS and better colour.

POST-HARVEST PATHOLOGY - WASTE PREVENTION CHECKLIST

K.H. LESAR

Sanitation: NB: For keeping spore load, as well as FCM and fruit fly under control - remove all fallen fruit and decayed fruit from the orchard. Bury or macerate and allow to dry in the sun.

Good fruit fly control: Use traps and bait regularly.

FCM: Apply pre-harvest sprays where trap counts and fruit drop due to FCM is high.

Skirt sprays for brown rot control: Refer to insert on brown rot.

Prevent injuries: Test for injuries. "Indigo-Carmine" can be used for this purpose. Test both in the orchard and the packhouse.

Apply packhouse fungicides with care: Check the mixing/application rates.

Packhouse sanitation:

- Never allow any fruit to lie around in the packhouse and develop spores.
- Constantly monitor concentrations of sanitizers in dump tanks, de-scaler water, rinses, etc.

- Spray the packhouse out with sanitizers regularly and immediately after finding a single mouldy fruit.
- Spray out trailers before they leave for the orchard.
- Rail cartons as soon as possible and prevent packed fruit standing on packhouse floor where it is hot. Green mould develops faster at 10°C than at 4.5°C.
- Store retention samples for each consignment and check regularly for waste and other developing factors.

Phytophthora brown rot

Swaar re ns - Phytophthora bruinvrot waarskuwing!!!!

Phytophthora bruinvrot word versprei wanneer Phytophthora spore tydens reën vanaf besmette grond op vrugte spat. Infeksie vind plaas en die vrug vrot na 'n tydperk van 4-6 dae. Dit gebeur dus dat geïnfecteerde vrugte gepluk en gepak kan word en tydens versending bruinvrot kan ontwikkel. 'n Enkele vrot vrug kan die hele karton vrugte besmet.

Die swam penetreer die skil binne drie ure en is dan buite bereik van die swamdoders wat in die pakhuis gebruik word soos TBZ en Imazalil. Dit is dus belangrik dat bruinvrot voorkomend in die boord, voor pluk, behandel word.

Daar is vier produkte wat hiervoor gebruik kan word, naamlik:

- Koperoksichloried (200 g/100 l (water),
- Mancozeb (200 g/100 l (water),
- Aliette (250 g/100 l (water); en
- Phytex (kaliumfosfonaat) 1 l/100 l (water).

Mancozeb en koperoksichloried is beide kontakdoders en kan tot 21 dae (verskeie markte) voor pluk gespuit word. Aliette en Phytex is beide sistemiese middels wat afbreek na fosfonaat en wat oor 'n tydperk van tot 6 weke Phytophthora se groei inhibeer. Aliette het 'n nul dae weerhoudingsperiode terwyl dié van Phytex

14 dae is. Dit moet as 'n ligte dekbespuiting aangewend word. Die Aliette of Phytex moet op die vrug self beland om bruinvrot beheer te gee en daarom moet die hele boom gespuit word, veral waar bome onder water was. Gebruik Aliette op sensitiewe varieteite (e.g. Star Ruby) wat onder stres verkeer.

Precautions when spraying Phosphonates:

To reduce the risk of burn on fruit, precautions need to be taken when spraying any form of phosphorous acid, or potassium phosphonate especially under water/heat stress or on sensitive varieties (e.g. Star Ruby). The quality of the source of phosphorous acid must be determined as poor quality material may lead to burn on fruit. *Adhere to the product label instructions.*

The control of post-harvest diseases on Southern African export citrus using the post-harvest fungicide thiabendazole

There seems to be a general reduction in the use of thiabendazole within the SA citrus industry. This is particularly alarming since latent pathogen infections have been observed in abundance during both the 2004 and 2005 citrus production seasons.

Why use thiabendazole (TBZ)?

TBZ was the first fungicide registered (1960s) for the control of the *Penicillium* moulds and the latent pathogens, *Diplodia* stem end rot and *Anthracnose* on citrus fruit. TBZ and benomyl belong



SOME CRI STAFF & CRI BOARD

Left to Right: Front: Timothy Zulu, Doctor Silinda, Bella Thulare, Jean De Gasperi, Laura Huisman, Andrea Vinson
 Second Row: Gerard Jacobs, Mark Fry, Kim Stolz, MC Pretorius, Johnson Thulare, Rooikie Beck, Tian Schutte
 Third Row: John Moll, Hoppie Nel, Tim Grout, John-Henry Daneel, and Kobus Breytenbach
 Back: Jock Danckwerts, Steve Turner, Anton Str h, Chris Kellerman, Gerhard Scheepers, Louis von Broembsen, Vaughan Hattingh, Henry Skinner, Justin Chadwick, Antoine Rouillard, Hennie le Roux

to the benzimidazole group of fungicides.

The benzimidazoles are distinguished from other traditional fungicides in that they control diseases both by contact and systemic action.

Due to the extensive pre-harvest application of benomyl for the control of citrus black spot and the post-harvest application of TBZ for control of the *Penicillium* moulds, populations of *Penicillium* moulds that were resistant to the benzimidazoles developed rapidly. There is therefore an unfortunate perception in the industry that TBZ is of no value in controlling important post-harvest pathogens. *However, TBZ is still effective in controlling the latent pathogens on citrus: Diplodia stem end rot and Anthracnose. All export citrus should therefore be treated with TBZ.*

TBZ is Internationally Accepted Following an in-depth scientific study that was ultimately concluded in 2001, TBZ obtained full legal approval for use within the EU. It had been successfully demonstrated that TBZ presented no risk to consumers, the environment or handlers applying the fungicide when used under standard good practices.

From 1995 until 2000 a Maximum Residue Level (MRL) of 6.0 mg/kg was applicable in the EU, and thereafter a level of 5.0

mg/kg was adopted - the current General Export Tolerance for SA exported citrus. The USA, Canada and Japan also accept the use of TBZ and apply an MRL of 10.0 mg/kg, while a Harmonized CODEX Alimentarius MRL of 10.0 mg/kg allows SA citrus producers using TBZ to send fruit to the Middle East and China.

Good Agricultural and Packhouse Practice

The occurrence and severity of post-harvest diseases - which all originate in the orchard - are determined by the pathogen load and its virulence, the susceptibility of the host (i.e. fruit) and the environmental conditions.

Prevention is the only effective means of reducing losses from the post-harvest diseases. Therefore it is essential to establish good cultural practices to ensure the delivery of sound, vigorous fruit to the citrus packhouse. The citrus packhouse is not a "hospital for sick fruit" and can, by no means, rectify the shortcomings of badly managed cultural practices.

Good packhouse practices and procedures must be well managed to maintain the status of healthy, vigorous, disease-free fruit arriving on the overseas market.

In the packhouse, citrus fruit must be washed in sanitised washing systems to ensure a reduction in fungal spores and prevent carry-over of a high spore load into the other systems.

After washing, the fruit should be treated with a mixture of post-harvest fungicides in a hot water bath dip application, dried to ensure retention of fungicide residues on the fruit and then waxed, dried again and then packed for export. Post-harvest citrus

CRI meet Board of Directors

Citrus Research International (CRI) personnel had a chance to meet the Board of Directors when a board meeting and strategic planning was held at CRI on Friday 18 November 2005.



Left to right Front: Hoppie Nel, Jock Dankwerts, Mark Fry, and Gerard Jacobs

Middle: John Moll, Chris Kellerman, Vaughn Hattingh, and Tim Grout

Back: Steve Turner, Anton Str h, Gerhard Scheepers, Louis von Broembsen, Justin Chadwick, Hennie le Roux

decay is controlled in dips by a combination of the standard post-harvest fungicides thiabendazole (TBZ), imazalil and guazatine (some markets), with prochloraz and SOPP being seldom-used additional treatments. A second option is to apply the post-harvest fungicides to the fruit in the citrus wax. The dip application is the preferred method of application.

These systems of washing the fruit, fungicide applications, waxing and packing are essential critical control points that together constitute good packhouse procedures.

The evaluation of the efficacy of guazatine formulated into citrus waxes (i.e. CitriWax and Deccowax)

CRI has heard claims that the efficacy of guazatine, formulated into citrus waxes, decreases as the guazatine-wax formulation ages over a period of time.

This scenario has been investigated by evaluating the efficacy of the guazatine in a newly formulated batch of CitriWax (formulated in December 2004), to determine after what period of manufacture this breakdown in efficacy of guazatine might occur.

Eight monthly evaluations have been completed and 100% control of the citrus pathogens *P. digitatum* (green mould) and *G. candidum* (sour rot) was recorded. A batch of Deccowax, formulated in 1996 was also evaluated for efficacy of the guazatine and 100% control of these two pathogens was also achieved.

These evaluations now prove that the guazatine-wax formulations CitriWax and Deccowax remain stable and that the fungicide retains its efficacy in inhibiting infections by the two major citrus

pathogens, green mould and sour rot.

Nevertheless, packhouses using the two waxes must ensure that the waxes are used up within a short period of time and are not stored from one season to the next to avoid any possible breakdown of the formulation.

These waxes must also be stored under roof and not outside where they might be exposed to adverse environmental conditions.

NB! The use of benomyl (Benlate) in the pre-degreasing drench

Citrus packhouses must revert back to using thiabendazole (TBZ i.e. Tecto 500) in the pre-degreasing drench at the start of the 2006 citrus season. The use of benomyl (Benlate), which breaks down to carbendazim, is no longer permitted due to the current MRL issue, and benomyl is not registered for post-harvest application.

Sitrus pakhuse moet terug gaan na die gebruik van tiabendazool (TBZ d.i. Tecto 500) in die voorontgroening storting tydens die begin van die 2006 sitrus seisoen. Die gebruik van benomyl (Benlate), wat afbreek na carbendazim, is nie meer toegelaat nie weens die huidige MRL kwessie, en Benomyl is nie geregistreer vir naoes aanwending nie.



DELECTA FRUIT

Tel: (+27 21) 930 1181 Fax: (+27 21) 930 1183

info@delecta.co.za www.delecta.co.za

Block 4
De Tijger Office Park
McIntyre Street
Parow North
7500