EXTENSION BRIEFS

MAY/JUNE 2008

HENNIE LE ROUX & HANNES BESTER
Citrus Research International

INTEGRATED PEST MANAGEMENT (T.G. GROUT)

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 is critical to determine whether control measures taken are adequate. Sanitation of split, stung or infested fruit in the trees, or fallen fruit on the ground, should take place at least once a week.

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 (J.S. VERREYNNE)

Maturity indexing

Maturity indexing on early 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 hand-held 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.

Degreening

The publication "Common Defects Associated with Degreening of Citrus" by Andy Krajewski and Tim Pittaway is a must for any grower who degreens fruit. It is available from CRI. It puts degreening in perspective, gives the correct manner of treatment as well as a photographic identification of degreening defects.

Pruning

Pruning of early cultivars (Satsuma, Clementine) should be done during this period as soon as possible after harvest. Prune heavier after a light crop and if a heavy crop is expected and when the orchard has a history of alternate bearing.

Post harvest 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.

NAOES PRAKTYKE (P.J.R. CRONJÉ)

Vir die voorkoming van naoes fisiologiese afwykings is die korrekte produksiepraktyke, soos bemesting en besproeiing, uiters belangrik. Maar tydens die oes en pakproses is daar egter drie kritiese faktore wat die kwaliteit van die vrugte beïnvloed. Eerstens moet die optimum plukvenster vir elke kultivar per area bekend wees (d.w.s. rypheidsindeksering) en gehandhaaf word. Daar moet dus selektief gepluk word om vrugte van dieselfde kleur en volwassenheid saam na die pakhuis te stuur. Snoei, om die lighuishouding te verbeter, kan die proses vergemaklik. Ontgroening is die volgende faktor; buiten die korrekte konsentrasie van etileen is dit krities dat die regte temperatuur en relatiewe humiditeit (95%+) gehandhaaf word:

Optimum ontgroeningstemperatuur

Satsuma mandaryne	18 tot 21°C
Clementine en Nova mandaryne	19 tot 22°C
Nawel lemoene	21 tot 23°C
Ander lemoene	23 tot 24°C
Pomelo's en suurlemoene	24 tot 25°C

Ontgroen altyd meer sensitiewe vrugte teen die laagste temperatuur. Faktore soos kultivar en omgewing asook uiterste klimaat tydens vruggroei bepaal vrugsensitiwiteit. Historiese rekords van boorde kan 'n aanduiding gee van moontlike probleme. Die etileenbehandeling is die effektiefste as vrugte van dieselfde kleur gelykertyd behandel word. Die tydperk van die behandeling moet ook so kort as moontlik wees. Hou die CO_2 vlakke onder 0.3% (3000 dpm) deur die ventilasie sodanig te stel; hoë CO_2 vlakke verlangsaam die ontgroeningsproses deur as kompeterende inhibitor teen etileen op te tree. Stadiger ontgroeningstempo sal 'n langer tyd in die ontgroeningskamer vereis en 'n verkorte rakleeftyd tot gevolg hê. Die derde faktor waarop gefokus moet word is temperatuurbeheer. Eerstens moet daar gelet word op die hantering van die vrugte vanaf die boom tot in die pakhuis en spesifiek die verwydering van veldhitte. Dit is belangrik dat vrugte vanaf die oomblik na oes nie aan hoë temperature blootgestel word nie en indien moontlik afgekoel word. Die tempo van vogverlies uit die vrug is direk afhanklik van die vrug se temperatuur asook die omgewing waar die vrug verkeer, m.a.w. hoe warmer die vrug is hoe meer vog word verloor. Die vogverlies speel 'n rol in verskeie skildefekte bv. "Zebra skin". 'n Eenvoudige maatreël soos nat komberse oor die vrugtekrat of plukwa sal keer dat die vrugte nie warm gebak word as die krat of wa in die son moet staan nie. Tweedens moet daar gepoog word om vrugte na verpakking so spoedig moontlik in die koueketting te kry. Al dié fasette het 'n betekenisvolle invloed op vrugrespirasie en vogverlies en indien die korrekte stappe geneem word, kan die respirasietempo en dus veroudering so laag as moontlik gehou word. Dit verseker dat vrugte 'n langer rakleeftyd het en dat die ontwikkeling van fisiologiese afwykings verlaag word.

To reduce the incidence of peteca spot of lemons it is advisable to delay harvest while oleo conditions are prevalent (cold, misty and high relative humidity). Be sure not to harvest outside the normal picking window as immature fruit are considered to be more prone to peteca. In the packhouse some practices were found to affect the occurrence of peteca. Fruit should be stored for 3-5 days before packing. Avoid over-brushing and excessively hot drying tunnels. Heavy waxes are known to cause more peteca. Fruit should also be brought under cooling conditions as soon as possible after packing. Peteca is viewed as a post-harvest disorder, but is most probably the result of sub-optimal cultural and environmental factors. It is therefore important to maintain optimum irrigation scheduling during warm dry periods of fruit development. A new strategy that could give an indication of peteca spot sensitivity before harvesting is by picking fruit and storing them (~10 fruit) in transparent plastic bags at room temperature for approximately one week. Without opening the bags check fruit for peteca spots. This should be done a week or two before the proposed harvesting date and could give an indication of susceptibility to peteca spot.

Chilling injury on citrus fruit to certain markets (e.g. Japan, USA) remains problematic. Chilling injury occurs during shipment and can manifest itself as pitting of the rind. The edges of these pits are usually well defined. Chilling damage due to forced-air cooling or prolonged cold storage can be visible as a mild discolouration or scalding over a continuous surface of the fruit, and not as randomly distributed spots. The disorder occurs when fruit is stored at temperatures below the cultivar's threshold. Chilling injury is furthermore dependent on duration at temperatures below the critical threshold for a cultivar. Susceptibility could change during the season (fruit are more prone to chilling injury at the early and later stages of the season). Fruit with better colour development normally are less prone to chilling injury. Due to the fact that susceptibility changes during the season and immature and overmature fruit are more prone to chilling injury, maturity indexing should be done for each cultivar. Care should be taken with the fruit that would be harvested during the first and last weeks of the picking window as these fruit are more sensitive to chilling injury. If possible these fruit should not be subjected to chilling conditions.

Waxing, film wrap (reducing water loss), warm water baths and the application of certain fungicides (e.g. TBZ) are known to reduce, but not eliminate, chilling injury.

GRONDGEDRAAGDE SIEKTES (M.C. PRETORIUS)

Phytophthora en aalwurmbeheer

Dit is nou 'n goeie tyd van die jaar vir die winterreënvalgebiede 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 bruinvrot

Herfsreëns kan lei tot ernstige naoesbederfverliese wat veroorsaak word deur *Phytophthora* bruinvrot soos wat verlede jaar ondervind is deur sekere produsente. 'n Enkele vrug besmet 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 somerreënvalgebiede word bruinvrot op sitrus hoofsaaklik veroorsaak deur die swam *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 die winterreënvalgebiede daarenteen kom *Phytophthora citrophthora* ook voor. Hierdie swam beweeg hoër op in die boom en kan vrugte tot bo in 'n sitrusboom besmet. Daar word dus aanbeveel dat die bome in hierdie streke volledig bespuit 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 fosfonaatblaarbespuitings nie nodig nie. Indien dit egter 'n nat jaar is moet die bome met of 'n fosfonaat, koper of mancozeb gespuit word om bruinvrot te beheer. Kontakmiddels kan gespuit word, nl. mancozeb en koper. Aansienlik beter beheer word egter met fosfonaat swammiddels verkry indien dit as 'n blaarbespuiting toegedien word. Stamaanwendings is nie effektief teen bruinvrotbeheer nie.

Vermy die gebruik van die fosfonate indien toestande mag

voorkom wat bome onder enige vorm van stres mag plaas. Produsente het oor die algemeen 'n probleem om te weet wanneer hulle 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. Bly dus weg van fosfonate op Satsumas en ander sagtesitruskultivars wat gestres word om die interne kwaliteit te verhoog.

WAARSKUWING – *PHYTOPHTHORA* BRUINVROT

Dien sleg produkte toe wat geregistreer is vir gebruik teen *Phytophthora* bruinvrot. Fighter is die enigste geregistreerde fosfonaat en is tans slegs vir harde sitruskultivars geregistreer. **Aliette** is glad nie geregistreer vir die beheer van *Phytophthora* bruinvrot nie. Aliette mag volgens die etiket nie na April maand toegedien word nie!! Verseker dat die bome onder geen vorm van stres is wanneer die middels toegedien word nie.

BESTUUR DIE STIKSTOFSTATUS VAN SITRUS (J.G.K. COETZEE)

Van al die voedingselemente is stikstof die een wat die meeste aandag verg. Die stikstofstatus van die bome moet bestuur word sodat dit gedurende die laat winter en lente (Julie tot Oktober) hoog is en dan geleidelik daal om in die laat somer en herfs (Februarie tot Junie) 'n laagtepunt te bereik. By vroeë kultivars soos Satsumas moet die lae stikstofvlak selfs vroeër bereik word. Om die hoë en lae stikstofvlakke te bereik, moet voorsiening deur bemesting beheer word.

Control of nitrogen supply

High N-status. Control is obtained by starting with the first nitrogen application in July (Northern areas) or August (Western Cape and Vaalharts). Depending on the clay content of the soil and the type of irrigation used, one, two or more applications are required to maintain the high until October and to facilitate the steady decrease reaching a low in February to June. The aim is to increase the nitrogen content of the trees rapidly, keep it at a high for 3 to 4 months and then let it decrease gradually. The high concentration of nitrogen in the trees is required for cell division, cell growth and fruit set.

Lae N-status Gedurende November moet die stikstofstatus van die bome begin daal om die minimum gedurende Februarie tot Junie te bereik. Die lae stikstofvlak gedurende Februarie tot Junie, is noodsaaklik vir die produksie van kwaliteit vrugte en die akkumulasie van reserwes vir die komende bot, blom, seldeling en vrugset periodes. Daar is net een manier waarop bepaal kan word of die stikstofstatus van die bome reg bestuur word, en dit is om 'n vaste program te volg en dit met blaarontledings gedurende Februarie tot Junie te kontroleer. Ongelukkig kan betroubare monsters nie maklik gedurende Augustus tot Desember geneem word nie en moet ons wag tot Februarie voordat die blaarmonsters gepluk word.

Blaar- en grondontledings

By sitrus word blaar- en grondmonsters gedurende Februarie tot Mei geneem maar die periode kan tot Julie verleng word. Die enigste probleem met monsters wat in Julie geneem word, is die beperkte tyd om die resultate betyds te verskaf sodat met bemesting in Julie/Augustus begin kan word.

Ensure that the correct leaf is picked from the trees in the index rows or block. Collect 50 to 100 leaves per sample. Take the soil sample at the same index trees. Collect 15 to 20 subsamples, mix and submit 500 g of the composite samples for analyses.

Better late than never??

This could be relevant for nitrogen fertilisation, but every delay in the application will stretch the flowering period resulting in various stages of fruit development. If the nitrogen supply is too low, fruit set and size will seriously be reduced.

Neem dus blaar- en grondmonsters in Februarie tot Mei om te bepaal hoe goed die bemestingsprogram, veral die stikstoftoedienings in die behoeftes van die bome voorsien het. Verskaf ook die vorige bemestingsprogram wat geëvaluëer moet word aan die persoon wat die bemestingsadvies verskaf. Daarsonder is die ontledings veel minder wêrd.

Deficiencies

Any nutrient deficiency will reduce the potential of the trees. It is therefore important to avoid going into this high activity period of flowering and fruit set with any deficiency. Foliar sprays can be used to correct deficiencies or at least reduce their impact, even during autumn and winter.

Maak seker dat die regte dosis gespuit word en dat toestande so gunstig moontlik vir opname deur die blare is. Die aanvaarbare dosis is 100 mg Zn, 300 mg B, 50 mg Cu en 450 mg Mn per liter wat gespuit word. Pluk die blaarmonster voordat u 'n herfs of winterbespuiting doen.

POST HARVEST PATHOLOGY WASTE PREVENTION CHECKLIST (K.H. LESAR)

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, stings, 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 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 dumptanks with chlorine, chlorine dioxide or quaternary ammonium compounds. (check regularly and keep records of concentrations).
- Post-harvest fungicides (regular checks / records).
- Disinfection of packhouses, trailers, picking bins, etc. (Sterimist, formalin, etc.).

The fruit: Our most important rots develop from injuries.

- Minimise picking injuries (Indigo carmine test).
- Spray for Phytophthora brown rot.
- Control fruit fly and FCM. The main type of decay found in cartons is green mould and sour rot. This type of waste is mainly caused by injuries made by fruit fly and FCM.
- Minimise any delay between picking and treatments in packhouse.
- Prevent over-maturity.
- *Training of contract pickers to handle fruit correctly. Indications are too many injuries and resulting high waste over the last 2-3 seasons (2004-2006) NB!!!*
- Prevent build-up of latent pathogen (Diplodia, Anthracnose) inoculum by pruning of dead wood in trees at end of season.

How safe is your descaler and dumptank water?
A simple method to check whether your descaler a nd/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 by pushing 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 into a paper bag for your control treatment.
- Measure the concentration of your sanitising agent (chlorine, harvest wash, etc.) in the descaler water prior to putting the injured fruit through the system.
- Place 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 with 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.

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 already fungicide treated, 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 packline must be cleaned and disinfected every day, after production.

One needs to understand how sanitizers complement the use of fungicides and the reality of what sanitizers can and cannot do.

The difference between fungicides and sanitizers

Fungicides are specific and only kill specific fungi. Whereas sanitizers are non-specific and will kill not only fungi but bacteria as well. Fungicides will kill fungi over a prolonged period whereas sanitizers 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, sanitizers are highly reactive and once inactivated will no longer offer any residual protection. Sanitizers 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 sanitizer will lose its activity.

Sanitizers, thus, 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 sanitizing the water and preventing spores washing onto clean fruit or into wounds on clean fruit.

Effective use of any sanitizer requires a reliable, approved test kit *(no dipsticks)* to be able to read and monitor the sanitizer concentration in a washing system, and maintain the sanitizer 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 sanitizer and the less effective the sanitizer 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.