

EXTENSION BRIEFS FOR JUNE & JULY 2014

H.F. LE ROUX & J.J. BESTER *Citrus Research International*

INTEGRATED PEST MANAGEMENT False codling moth S.D. MOORE

All fruit remaining on orange, mandarin and grapefruit trees (i.e. all FCM susceptible cultivars) after harvest must be removed and destroyed. This is because FCM activity does not cease during winter and any remaining fruit can therefore serve to facilitate this activity. In addition, this winter fruit creates a reservoir of inoculum of FCM for the following spring. Conversely, removal of all fruit after harvest can dramatically reduce FCM levels in the following season. In addition, fruit fly numbers can also build up on unharvested fruit.

Packhouses are strongly urged to implement the most painstakingly thorough inspection systems for FCM, preferably on delivery of fruit at the packhouse. Grading of fruit should similarly be as stringently applied as possible at various points on the packing line. Staff appointed to conduct such inspections and grading should be properly trained and incentivised to do the most reliable and accurate job possible. Valencia cultivars should be inspected and graded as thoroughly as Navel cultivars.

Red scale T.G. GROUT

Those growers who have experienced red scale problems during the past season should consider applying narrow distillation range horticultural mineral oils. Although the oil price is higher than it used to be, oil is probably the most IPM-compatible treatment option for red scale. The generally accepted period to apply this treatment is from budswell to budburst (mid-July to mid-August). The concentration to be used is dependent on the grade of the oil to be applied (generally 1.0 – 1.25% medium grade oil). When spraying oil, care must be taken to apply the oil as a full cover, film wet spray. This is be-

cause oil suffocates the insect, a job it cannot do if the scale is not covered with oil. Trees to be sprayed must also not be under any stress. Other treatments for red scale would normally be applied in August, September or after petal fall and will be discussed in the next edition of Extension Briefs.

Ant control T.G. GROUT

Ants are usually indirect pests on citrus and interfere with the behaviour of natural enemies, sometimes protecting and even transporting pest species. The winter months are a good time to control ants before honey-dew-producing pests such as aphids increase on the spring growth flush. If trunk barriers are being used as a control method they should be replaced or rejuvenated at this time and trees should be skirt-pruned to prevent branches from touching the ground later in the season when bearing fruit.

NA-OES PRAKTYKE P.J.R. CRONJÉ

Vir die voorkoming van na-oes fisiologiese afwykings is die korrekte produksiepraktyke, soos bemesting en besproeiing, asook snoei, uiters belangrik. Daar is egter gedurende die oes en pak-proses kritiese faktore waarop gelet moet word wat die voorkoms van skildefekte, asook algemene vrugkwaliteit kan beïnvloed. Bepaal die optimum plukvenster vir elke kultivar per boord deur 'n maand voor die beplande oesdatum met rypheidsindeksing (interne kwaliteit en skilkleur) te begin. Daar moet gepoog word om die temperatuurlading op die vrug te beperk vanaf die plukproses tot in die pakhuis, deur die vrugte se veldhitte so gou as moontlik te verwyder (bv. deur vrugte gouer te “drench”). Die paklyn het 'n invloed op skilkondisie, asook die voorkoms van skildefekte, en dit is belangrik dat detail aandag aan alle bewegende dele, bv. rollers en borsels, asook waks-tipe en

aanwending geskenk word.

Ontgroening is 'n belangrike aspek van die sitrus na-oes hantering en moet optimaal bestuur word. Dis belangrik om te besef dat daar 'n interaksie tussen kultivar, vrugrypheid en die effektiwiteit van ontgroening bestaan. As vrugte te vroeg (onvoldoende kleur-ontwikkeling aan boom) in die ontgroeningskamer geplaas word, sal die verlangde kleur nie ontwikkel nie. Gedurende ontgroening is daar egter aspekte wat streng beheer moet word, nl. etileen konsentrasie (1-3 ppm), temperatuur en relatiewe humiditeit (95%+).

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
Pomelos en suurlimoene	24 tot 25°C

Ontgroen altyd meer sensitiewe vrugte teen die laagste temperatuur. Die etileenbehandeling is die effektiwste as vrugte van dieselfde kleur gelykertyd behandel word. Die tydperk van die behandeling moet ook so kort as moontlik wees. Hou die CO₂ vlakke onder 0.3% (3000 dpm) deur die ventilasie sodanig te stel; hoë CO₂ vlakke verlangsamen die ontgroeningsproses deur as kompeterende inhibeerder teen etileen op te tree. 'n Stadiger ontgroeningstempo sal 'n verlenging van die tyd in die ontgroeningskamer vereis en 'n verkorte rakleef tyd tot gevolg hê. Vir meer informasie raadpleeg die “Common defects associated with degreening of citrus” deur Krajewski en Pittaway, wat bestel kan word van CRI in Nelspruit (kontak Bella 013-759 8000).

Die koueketting se invloed op die vrugkwaliteit is van kardinale belang en sal nie net die voorkoms van skildefekte beïnvloed

nie, maar ook algemene kwaliteitsaspekte soos vrugfermheid en rakkleeftyd. Die belangrikste faset van die koueketting is dat dit nie onderbreek mag word nie, m.a.w. as vrugte tot op die verlangte temperatuur verkoel is, mag die temperatuur nie weer styg nie.

CROP AND FRUIT QUALITY MANAGEMENT

O.P.J. STANDER & J.J. BESTER

Maturity indexing: Maturity indexing on mid-season to late 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 using 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.

Degreening & postharvest rind disorders:

The two publications Common Defects Associated with Degreening of Citrus by Andy Krajewski & Tim Pittaway and Postharvest Rind Disorders of Citrus Fruit by Paul J. R. Cronje are a must for any grower. Both available from CRI. Contact Bella Thulare 013 759 8000 / bella@cri.co.za.

Pickers training and monitoring: It is important that growers ensure pickers are trained to harvest citrus fruit and are familiarised with important protocols during picking and handling of fruit. Picking bags should always be carried on the side of the waist to avoid crushing of fruit between the body and the ladders, bins or trees. Picking bags should at all times be free of leaves, shoots or sand and kept dry throughout. To avoid lesions on fruit, fingernails of pickers should be short and clippers and ladders handled correctly, i.e. no long stems and limited contact between ladders and fruit. Pick-

ing of low-hanging fruit as well as collecting of dropped fruit should be avoided. At each bin, two sorters should be stationed wearing gloves and fruit quality of each picker monitored via the sorters, by an appointed team leader.

Pruning: Pruning for early and mid-season cultivars should be done during this period as soon as possible after harvest. All of the following should be removed during pruning: old, broken and dead shoots/twigs; weak and entangled shoots crossing each other or hanging downwards; any rootstock regrowth (water shoots) or regrowth from main frame shoots on the inside of the tree. Light levels of above 30% of full sunlight are necessary for optimal photosynthesis, therefore in very dense trees at least one "window" cut should be made to allow for adequate light distribution to improve the bearing wood within the tree. Increase in photosynthesis and light distribution will lead to increased fruit size and internal fruit quality (Brix°), better fruit colour development, increase in rind integrity as well as a more uniform fruit distribution across the tree, i.e. fruit quality. Pruning can also be used as a thinning



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technique: prune more heavily after a light crop if a heavy crop is expected and when the orchard has a history of alternate bearing. A follow-up prune of regrowth in the summer is of critical importance. Pruning tools should always be sanitised with 10% Jik when moving from one orchard to another.

Flower induction: Citrus trees require a rest period of about 6 weeks to ensure that adequate flower induction takes place. The two mechanisms involved in floral induction in citrus involve (i) low temperature, or (ii) controlled-drought stress, both to ensure no root activity. In the absence of low-temperature rest, citrus trees should be exposed to controlled-drought stress for a 4 to 6 week period during June and July if possible.

BEMESTING / FERTILISATION

J.T. VAHRMEIJER & J.G.K. COETZEE

Blaarontleding / Leaf analysis

The very last opportunity to get leaf analyses done is in June and July. Leaf analysis is still the best diagnostic method to measure the nutritional status of the trees.

Grondontledings / Soil Analyses

Soil analyses should be done annually and preferably during the same time as leaf analyses. A good practice is to take soil samples from the same spot every year to ensure that an accurate historic dataset is developed for the soils. Sampling areas can be marked with GPS coordinates.

Other analyses

If manure or compost is used as a fertiliser source, then the material should be analysed to determine the nutrient value of the organic material. The amount of organic material applied is determined by the amount of nutrients that is available in the compost or manure. Normally the nutrient content of organic material is much lower than inorganic fertilisers and therefore high quantities

of organic material are applied. Be careful that excessive nutrients or toxic amounts of other elements are not applied.

Bemesting / Fertilisation

The fertilisation programme is compiled from results of both soil and leaf analyses. Potential yield is used as an indicator for the amount of fertiliser to be applied. Use historic yield data to determine a realistic target yield.

The fertilisation programme for the 2015 crop starts in July or August 2014, depending on the production area, and is usually completed by November (where micro-sprinklers are used) or January (where drippers are used). Due to the properties of the specific chemical ion, the properties of the soil and the physiological requirements of the trees, certain basic rules should be adhered to when applying fertilisers to citrus. See Table 1.

Blaarbespuitings word gebruik om tekorte reg te stel of om die bome se fisiologie te manipuleer. Vir manipulasie is dit hoofsaaklik lae biuret ureum of kaliumnitraat wat gebruik word. Beide bespuitings moet 6 tot 8 weke voor die 50% blom-stadium toegedien word. Dit is meestal Julie of vroeg Augustus. Tabel 2.

POSTHARVEST PATHOLOGY – WASTE PREVENTION CHECKLIST

K.H. LESAR & A. ERASMUS

Intermittent rainfall already experienced in the summer rainfall production areas and possible heavy rain in the winter rainfall production areas during the 2014 packing season could lead to the following problems:

- high pathogen inoculum levels in orchards on all surfaces resulting in
- infections by latent pathogens – Anthracnose, Diplodia and Phomopsis stem-end rot
- infections by wound pathogens – green and blue mould and sour rot
- infections by soil pathogens – *Phytophthora* brown rot, sour rot, *Trichoderma* and *Fusarium*

Precautions and Recommendations

- Minimise injuries to fruit during picking, handling and transport to packhouse.
- Handle the fruit as a perishable product, because it is a perishable product.
- Ongoing removal of dead wood from trees.
- Ongoing orchard sanitation is a non-negotiable requirement.
- Minimise the delay between picking and treatment. The longer the delay the higher the risk for high decay.
- Packed fruit must be cooled down as soon as possible.
- Spray trees with contact or systemic fungicides to prevent brown rot.

Phytophthora brown rot

Adequately skirt trees to minimise the risk of *Phytophthora* brown rot infection after rainfall.

Do not pick skirt (low-hanging) fruit for packing. Remove this fruit before harvesting and discard or sell on the local market.

Spray contact fungicides only (copper at 200 g/100 ℓ or Dithane at 200 g/100 ℓ) as a preventive measure against *Phytophthora* brown rot after rainfall. Contact fungicides must be re-sprayed after any follow-up rainfall.

The phosphonates are systemic and highly effective against *Phytophthora* brown rot. **Fighter 350 and Brilliant (Ammonium Phosphite)** are currently the only registered phosphonates for the control of brown rot on citrus. The registered foliar applications of phosphonates for the control of Root and Collar rot will also be effective against brown rot whereas phosphonate stem treatments and soil applications will not control brown rot.

In the summer rainfall regions where *P. nicotianae* predominantly occurs, only low hanging fruit and leaves need to be sprayed.

P. citrophthora is more prevalent in the cooler winter rainfall regions. As this pathogen also forms aerial spores, it can be found higher in a tree. Snails can also spread it higher up

TABLE 1

ELEMENT	MIKROSPUITE/MICRO-SPRINKLERS	DRUPPERS/DRIPPERS
N	Dien die meeste N gedurende Julie tot September toe. Die aantal toedienings word bepaal deur die totale massa kunsmis wat toegedien moet word en die klei-inhoud van die grond. Die beginsel vir sproeibemesting of hand- en meganiese toediening bly dieselfde.	Die beginsel is soos die vir mikrospuite maar die massa word verdeel in 'n groot aantal toedienings wat tot Desember strek. Die meeste N moet egter nog steeds in Julie tot September toegedien word, en die toedienings moet nie veel langer as Januarie aanhou nie.
Organiese materiaal	Dien al die organiese materiaal soos kompos, kraal- of hoendermis gedurende Julie tot Augustus toe. Genoeg tyd moet gelaat word sodat 70% van die stikstof teen Oktober vrygestel is.	Die huidige metode is om die totale massa organiese materiaal te verdeel en gelyke massas bo-op elke drupper te plaas. Dit moet gedurende Julie/Augustus gedoen word.
P	Use only single or double supers and apply it in a narrow strip of about 5 cm wide, below the drip line of the trees.	Use a water soluble source like mono ammonium phosphate (MAP) or phosphoric acid and apply it over an extended period (4 to 5 months) at lowish concentrations.
K	Wanneer sproeibemesting gebruik word, kan dit teen 100 g K per boom per toediening oor die hele lengte van die siklus toegedien word. Wanneer meganies of met die hand uitgestrooi word, word een (leem- tot kleigronde) tot drie (sandgronde) toedienings gedurende die lente/vroeë somer gemaak	Dien die aanbevole massa kaliumnitraat, -sulfaat of -chloried oor 'n periode van 3 tot 6 maande gedurende Julie tot Desember toe.
Ca	The most critical time for a deficiency would be August to October. Therefore when gypsum is required, apply it during August or September	Calcium nitrate is the only suitable source and must be applied during August or even July to September/October. The application can however be extended to December. Remember to take into account the nitrate component of the calcium nitrate when calculating N fertilisation.
Magnesium	Dolomitiese kalk, magnesium-hidroksied of -oksied kan in die lente, vroeë somer of herfs toegedien word.	Magnesiumnitraat of -sulfaat word ook oor 'n periode van 3 tot 6 maande toegedien. Die nitraat word gewoonlik vroeg en die sulfaat na Oktober toegedien.
Sulphur	Sulphur deficiency has the most devastating effect on fruit set. Where a deficiency is present, apply the sulphate during July to August. Maintenance applications are done during spring or early summer.	Magnesium-, potassium or ammonium sulphate are the sources and the application is timed to fit the requirement of these four elements.

TABLE 2

ELEMENT		TIMING
N	Low biuret urea to stimulate blossom or improve the quality of the blossom. Low biuret urea to supplement the nitrogen supply	July or early August October to February
P	Om die suur-inhoud van die vrugte te verminder. Om die TOV van die vrugte te verhoog. Om dunner en gladder skille te gee.	6 weke na blom-blaar-val. 6, 4 en 2 weke voor oes.
K	Potassium nitrate to stimulate blossom or improve the quality of the blossom. Potassium sulphate to supplement the K supply Potassium nitrate to supplement the K supply	July or early August August/September for the best results and up to February for maintenance. After fruit drop to December
Mg, Zn, Mn, B en Mo	Waar 'n tekort ondervind word. Instandhouding	Julie en weer in Oktober. Oktober tot Desember
Cu	Usually only recommended to correct a deficiency	May to July, before flowering



into the trees and snails should be controlled well. It is therefore essential to spray the whole tree. When a drier summer is experienced no precautionary sprays are necessary.

All the soft citrus cultivars are very sensitive for phytotoxic burn when a phosphonate is applied. Read the warning notification on the labels of these products and do not spray soft citrus cultivars with phosphonates.

RECOMMENDATIONS TO PACKHOUSES THAT ARE STILL DEGREENING

Pick only fruit that has reached colour break, selectively for degreening. Only place fruit of the same colour into the same crates, and not fruit of different colours in the same crate.

Drench with recommended mixture within 24 hours. Fruit must not spend too long in degreening (preferably not longer than 48 h; maximum 72 h).

Extended time in degreening predisposes fruit to poor quality, shorter shelf life and waste.

NB Do not dump wasty fruit (especially green and blue mould and sour rot), found in bins after degreening, into packhouse washing systems. pre-sort and remove this infected fruit before the fruit moves into the packhouse and dispose of this fruit immediately.

RECOMMENDATIONS TO PACKHOUSES THAT ARE NOT DEGREENING

OPTION: Drench with STANDARD MIXTURE within 24 hours if fruit is not packed immediately, and allow bins to stand for a maximum of 1-2 days before packing.

Remove wasty fruit in bins. Do not dump wasty fruit into packhouse washing systems.

Ethephon (Ethrel) application on export fruit
NB!! A change to the citrus Ethephon EU

MRL (now 0.05 mg/kg) and a revised Ethephon residue testing methodology are recent developments producers using Ethephon (Ethrel) should note. The recommended restrictions that apply are as follows:
Not permitted: EU, USA, Japan (postharvest) and other markets, except where other restrictions apply.

Permitted: Canada, Middle East and Indonesia

Refer: Cutting Edge/Snykant no. 84 and 'Recommended Usage Restrictions' February 2014.

In the markets where Ethephon/Ethrel is permitted, those packhouses that do not have access to ethylene gas degreening can easily, cheaply and effectively apply Ethrel in the packhouse. One major drawback with this application is that relatively green fruit cannot be easily graded out for blemishes.

The colour should shift by 1 or 2 colour plates after treatment and packing if the fruit



TlouMasehela, who is also a researcher who is part of the Honeybee Forage Project, took this photograph of a honeybee on a sunflower.

BE A BEE-FRIENDLY FARMER

- Be aware of how you use agro-chemicals. Follow the instructions on the labels carefully. Inform beekeepers in time before spraying starts, so that they can move their hives to safety. Honeybees spend many days in crop land (pollinating or foraging), and are therefore very susceptible to the use of pesticides or insecticides.
- Allow controlled access so that beekeepers can put out their hives on your land - especially if there are important bee forage trees or crops growing on it. To be on the safe side, work through your local beekeeping association.
- Consider the natural vegetation growing on your farm when making plans towards the management and use of your land. Indigenous plants provide valuable habitat for various species of wild bees, including South Africa's indigenous honeybees.
- Plant more bee-friendly indigenous plants local to your area when you are rehabilitating specific stretches of land or are planting a new farm garden. It is important to use local subspecies or varieties, to avert inappropriate hybridisations with your natural veld species in the vicinity. Your local nursery can provide valuable help.
- When planting trees as windbreaks, consider using ones that will also provide forage.
- The flowers of complementary crops such as lavender or basil, or fodder crops such as vetches, clovers, medics, lupines and lucerne add to the volume of bee-friendly forage on a farm.
- Where possible and safe to do so, try not to clear natural vegetation unnecessarily under powerlines or along road verges. Be aware of the fire risks, though.
- Be up-to-date with the latest regulations about the removal of eucalyptus trees, as is set out in the National Environmental Management: Biodiversity Act (NEMBA).

stands within the confines of the packhouse at a temperature range of 18-25°C or higher for a day or two prior to going into cold storage. Colour development will continue slowly after cold storage.

The application is applied on the packhouse line before waxing as a total loss spray over a set of brushes. Ensure that the brushes are adequately wet to ensure good coverage of the fruit.

The Ethrel is applied as follows:

156 ml Ethrel / 25 ℓ water for lemons grapefruit and Clementines (3 000 ppm).

210 ml Ethrel / 25 ℓ water for oranges (4 000 ppm).

plus the recommended amount of a non-ionic wetter.

NB. 2,4-D Decomone (250 ml/25 ℓ water) must be used when applying Ethrel.

Fruit must be dry before waxing.

Packhouse Sanitation

Constantly monitor sanitiser concentrations in dump tanks and “descaler” water washing systems, and fungicide concentrations in the hot water fungicide bath and/or flooder.

Change dirty systems on a daily basis with clean water and full strength chemicals.

These compounds do not work in dirty systems with high bacterial and fungal spore load and organic material.

Top up these systems correctly, and if not sure, revert to CRI for proper procedures.

Spray all packline belts, brushes, conveyors and all surfaces including coldrooms, de-greening rooms etc. within the confines of the packhouse and also the packhouse with a suitable sanitiser, on a daily basis.

Likewise spray out trailers and bins with a suitable sanitiser before leaving for the orchard.

Remove all decay-rejected fruit from the packhouse.

Remove all infected fruit from grading belts before contaminating brushes and baths.

Sanitise grading belts regularly after removing infected fruit.

Remove all culled fungicide-treated fruit from the packhouse. Never allow this fruit to stand in a crate and rot in or near the packhouse. This allows for the selection of fungicide-resistant spores and these spores could be carried back into the packline.

Store all fungicide-treated local market fruit away from the packhouse.

Retention Samples

Hold back samples of each consignment of packed fruit for a period of at least 2 weeks and check regularly for waste and any other developing factors.

