

EXTENSION BRIEFS FOR JUNE & JULY '17

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INTEGRATED PEST MANAGEMENT

False codling moth S.D. MOORE

All fruit remaining on trees 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. Fruit fly numbers can also build up on unharvested fruit.

Packhouses are strongly urged to implement the most painstakingly thorough inspection systems for FCM on delivery of fruit at the packhouse, in line with the recommendations presented at CRI's postharvest workshops. Grading of fruit on the packing line should similarly be as stringently applied as possible. Packhouses should not hesitate to slow down the line speed to enable more careful scrutiny of fruit. Additionally, a designated inspection table should preferably be installed just before final grading and sizing of fruit. These should be equipped with excellent lighting. Staff appointed to conduct such inspections and grading should be properly trained and incentivised to do the most reliable and accurate job possible.

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 as these comprise the most IPM-compatible treatment option for red scale. The optimal 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. 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 later editions 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. Trees should also 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 rypheidsindeksering (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 en vrugte neig om 'n geler of bleker voorkoms te kry. 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 suurlemoene	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 rakleef tyd. Die belangrikste faset van die koueketting is dat dit nie onderbreek mag word nie, m.a.w. as vrugte tot op die verlangde temperatuur verkoel is, mag die temperatuur nie weer styg nie.

CROP AND FRUIT QUALITY MANAGEMENT

P.J.R. CRONJE & O.P.J. STANDER

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 an optimal maturity. 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. 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 are available from CRI. Contact Bella Thulare 013 759 8000, bella@cri.co.za.

Pickers training and monitoring: 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, finger nails of pickers should be short and scissors and ladders handled correctly i.e. no long stems and limited contact between ladders and fruit. Picking 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 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 and excessive regrowth from

main frame shoots on the inside of the tree. Light levels of above 30% of full sunlight are necessary for optimal photosynthesis - at least one "window" cut should be made to allow adequate light distribution and improve bearing wood. Increase in photosynthesis and light distribution will lead to increased fruit size and internal fruit quality (Brix^o), better fruit colour development, increase in rind integrity as well as a more uniform fruit distribution across the tree. Pruning can also be used as a thinning 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. Pruning also ensures better spray penetration during pest and disease control and much more cost-effective spraying.

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 analysis 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 2018 crop starts in July or August 2017, 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, the properties of the soil and the physiological requirements of the trees, certain basic rules should be adhered to when applying fertilisers to citrus.

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 dié 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 low 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-hidoksied 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.

Blaarbespuitings word gebruik om tekorte reg te stel of om die bome se fisiologie te manipuleer. Vir manipulasie is dit hoofsaaklik lae biureet 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.

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 blomblaarval. 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.

POSTHARVEST PATHOLOGY

K LESAR, W DU PLOOY & P FOURIE

While most packhouses now enter their peak time, important and basic practices such as sanitation and fungicide application must not be neglected.

Packhouse sanitation

The main aims of this practice are

1. to remove any infected fruit from the packhouse environment and
2. to sanitise surfaces with appropriate treatments.

These actions will reduce the inoculum (spore) levels, and the risk for future infections and fungicide resistance development.

Surfaces that should be considered in sanitation

- Packline surface – treat *daily* with QAC, but rinse with clean water afterwards; alternatively use chlorine or SOPP.
- Fruit surface – one of the *first* steps, when entering the packhouse, should be a fruit disinfectant treatment. Chlorine is the most popular active for this step. Remember to manage the Cl concentration, pH and ORP.
- Floors and walls – wash *weekly* with quaternary ammonium compound (QAC). These include the packhouse, degreening rooms and cold rooms.
- Orchard bins and picking bags – wash regularly.

Sources of inoculum (spores)

- Waste fruit – have a protocol in place to remove these fruit a.s.a.p. and to keep it in sealed containers.
- Juice fruit – these fruit are often treated with fungicides, sits in the packhouse area for some time till shipping to the juicing plant, and therefore holds a resistance risk.
- Retention samples – fruit was also treated with fungicides and holds a similar resistance risk as above.
- Post degreening fruit – degreening conditions are hugely favourable for disease development and unfortunately, some sporulating fruit are often tipped into the packhouse system.

Recommendations that can reduce the risk for infection and/or resistance development

- Treat all harvested fruit a.s.a.p., but within 12 - 18 hours as most fungicides cannot control infections older than a day. This is now more important than ever with the loss of guazatine.
- Don't let fruit stand from Friday afternoon to Monday morning without any fungicide protection
- Degreeen fruit for the absolute minimum period of time
- Do not exceed the volume limit of your packline: exceeding the

limit will result in accelerated agitation and movement of the fruit, which, in turn, will reduce the efficacy of sanitation and fungicide treatment

Fruit will move too quickly through the various control points:

The chlorine treatment = poor disinfection, spores surviving

The fungicide dip tank = loading suboptimal residue, poor infection control

The wax applicator = poor wax deposition on the fruit = suboptimal residue loading, poor moisture retention, negative impact on quality

• Limit the time from harvest to pack and eventual introduction to the cold chain

Some advice in managing retention fruit

- Have a dedicated person managing this task
- Fruit should be evaluated every day, decayed fruit noted on the carton and removed
- These infected fruit should be placed in a plastic bag immediately, and the bag sealed tightly – this is to reduce the risk of releasing inoculum (spores) into the packhouse atmosphere
- Fruit in retention samples have been treated with fungicides, and holds a serious resistance risk if spores are spread into the packhouse
- Green mould sporulation inhibition is a very important criterion to note, as the loss of sporulation inhibition is indicative of either fungicide resistance or poor fungicide application. To prevent spores spreading from these infected fruit, fruit exhibiting sporulation inhibition should be kept in sealed transparent plastic bags and incubated for another week to rate sporulation inhibition.

When the sporulation inhibition rating is concluded the bagged fruit must be destroyed (with the bag), well away from citrus orchards and packhouses to prevent spores from entering any production area.

• Do not keep fruit for longer than the shipping period

Ideally, the retention room should be some distance away from the clean area in the packhouse, and should be totally enclosed with controlled access. This room should be cleaned and treated with a QAC at least once a month.

