Extension briefs

JUNE AND JULY 2025

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Integrated pest management

False codling moth (S.D. Moore)

Orchard sanitation must continue diligently during the harvesting period. All fruit that remains on trees after harvest must be removed and destroyed two weeks after completion of harvesting, at most. This is because false codling moth (FCM) activity does not cease during winter, and any remaining fruit could serve to facilitate this activity. Plus, this winter fruit creates a reservoir of inoculum of FCM for the following spring. Conversely, removal of all fruit after harvest could dramatically reduce FCM levels in the following season. Fruit fly numbers can also build up on unharvested fruit.

Packhouses must continue to implement all aspects of the FCM systems approach (FCMSA) for fruit destined for the EU, diligently and accurately. For example, grading of fruit on the packing line must be conducted as stringently as possible. Advisably, packhouses should slow down the line speed, to enable closer scrutiny of fruit. And a designated inspection table, equipped with excellent lighting, should be installed just before final grading and sizing. Staff appointed to conduct such inspections and grading must have 20/20 vision, and be properly trained and incentivised, for optimal results. The Perishable Products Export Control Board (PPECB) pallet inspections are also a critical component of the FCMSA, to help filter out infested fruit. Thus, for optimal results, this process requires full collective cooperation.

Red scale (S.D. Moore)

Growers who recorded red scale infestation during the past season should consider applying narrow distillation range horticultural mineral oils. These constitute the most IPM-compatible treatment option for red scale. Furthermore, currently available and registered oils are safe for the tree. And – contrary to the old, less refined oils – if used according to recommendations, they will not result in phytotoxicity or crop reduction. The best period to apply this treatment is from budswell to budburst (mid-July to mid-August). The grade of oil to be applied (generally 1.0–1.25% medium grade oil) dictates the concentration to be used. When spraying oil, apply it as a full cover, film wet spray. Only spray stress-free trees. Prune the trees before spraying to help improve spray coverage of the tree framework, where many of the red scale insects survive. 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 ideal to control ants before honeydew-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. SAGA bait is effective against both the pugnacious ant and the brown house ant and is available from River Bioscience.

Naoespraktyke (P.J.R. Cronjé)

Die korrekte produksiepraktyke – soos bemesting en besproeiing, asook snoei – is uiters belangrik vir voorkoming van naoesfisiologiese afwykings. Daar is egter gedurende die oes en pakproses 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 ŉ 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 moontlik te verwyder (bv. deur vrugte gouer te stort/doop). Die paklyn het ŉ invloed op skiltoestand, asook die voorkoms van skildefekte. Dis belangrik dat noukeurige aandag aan alle bewegende dele (bv. rollers en borsels, asook wakstipe en aanwending) geskenk word.

Ontgroening is ŉ belangrike aspek van sitrus naoeshantering en moet optimaal bestuur word. Neem ook die interaksie tussen kultivar, vrugrypheid en die effektiwiteit van ontgroening in ag. As vrugte te vroeg (onvoldoende kleur-ontwikkeling aan boom) in die ontgroeningskamer beland, sal die gewenste kleur nie ontwikkel nie en vrugte neig dan om ŉ geler of bleker voorkoms te toon. Gedurende ontgroening is daar egter aspekte wat streng beheer moet word, nl. etileenkonsentrasie (1-3 ppm), temperatuur en relatiewe humiditeit (95%+).

Optimum ontgroeningstemperatuur

Satsuma-mandaryne	18 tot 21 °C
Clementine- en Nova-mandaryne	19 tot 22 °C
Nawellemoene	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. Die etileenbehandeling is die doeltreffendste as vrugte van dieselfde kleur gelyktydig behandel word. Die duur 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 inhibeerder teen etileen op te tree. ŉ Stadiger ontgroeningstempo sal ŉ verlenging van die tyd in die ontgroeningskamer vereis en 'n verkorte rakleeftyd tot gevolg hê. Vir meer inligting, raadpleeg *Common Defects Associated with Degreening of Citrus* deur Krajewski en Pittaway, wat hier bestel kan word: https://www.citrusres.com/shop/.

Die koueketting se invloed op vrugkwaliteit is van kardinale belang en sal die voorkoms van skildefekte, asook algemene kwaliteitaspekte soos vrugfermheid en rakleeftyd beïnvloed. Belangrik: die koueketting mag nie onderbreek word nie, m.a.w. as vrugte tot op die gewenste temperatuur verkoel is, mag die temperatuur nie weer styg nie.

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Crop and fruit quality management (P.J.R. Cronjé)

Maturity indexing on mid-season to late cultivars should now commence to predict the rate of change in fruit maturity, for harvest at optimal maturity. The aim is to define changes or the rate of change in acids and sugars, and to build up a database over several years. Random weekly sampling of fruit from each of 10 representative trees should start four to six weeks prior to the expected harvest date. Titratable acidity is determined by titration with sodium hydroxide and sugar content (Brix°), and by using a refractometer. The sugar: acid ratio must be calculated, and fruit colour should be read from a colour chart. These parameters should be plotted on a graph over time to identify trends, estimate harvest dates, and identify and manipulate problem areas in internal and external quality parameters.

Degreening and postharvest rind disorders The two publications, *Common Defects Associated with Degreening of Citrus* by Andy Krajewski and Tim Pittaway, and *Postharvest Rind Disorders of Citrus Fruit* by Paul J. R. Cronjé, are must-reads for any grower. Both are available to order from CRI at www.citrusres.com.

Pickers' training and monitoring Picking bags should always be carried on the hip to avoid crushing of fruit between the body and the ladders, bins, or trees. Picking bags should always be free of leaves, shoots or sand and kept dry throughout. Short fingernails on pickers will prevent lesions on fruit. Clippers and ladders must be handled correctly, i.e., no long stems and keep limited contact between ladders and fruit. Avoid picking of low-hanging fruit and collecting of dropped fruit. Two sorters should be stationed at each bin, wearing gloves, with the fruit quality of each picker monitored via the sorters by an appointed team leader.

Pruning For early and mid-season cultivars, pruning should be done promptly after harvest.

These 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
- excessive regrowth from main frame shoots on the inside of the tree.

Light levels 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°), better fruit colour development, increased rind integrity, as well as 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 pruning of regrowth in the summer is of critical importance. Pruning tools should always be sanitised with 10% Jik solution when moving from one orchard to another. Also, pruning ensures much more cost-effective spraying and better spray penetration during pest and disease control.

Flower induction Citrus trees require a rest period of about six weeks to ensure adequate flower induction. The two mechanisms involved in floral induction in citrus are (1) low temperature, and (2) controlled-drought stress, both of which prevent root activity. In the absence of low-temperature rest, citrus trees should be exposed to controlled drought stress for a period of four to six weeks during June and July, if possible.


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Bemesting/Fertilisation (P.J. Raath and J.G.K. Coetzee)

Blaarontleding/Leaf analysis Final chance to get leaf analyses done: June and July. Leaf analysis is still the best diagnostic method to measure trees' nutritional stats.

Beskou blaar-analise as 'n aanvulling tot grondanalises, eerder as die enigste norm wat vir die daarstelling van 'n bemestingsprogram gebruik kan word. Dit is ook nuttig in gevallestudies waar blare vanaf "siek" bome gemonster word, asook vanaf naburige, nie-geaffekteerde bome. Die gesonde/beter bome se blare dien dan as direkte kontrole, sodat die tyd van monsterneming en al die ander veranderlikes minder krities, of nie ter sake is nie. Geen norm word gebruik nie, maar wel die relatiewe verskille tussen die twee monsters.

Grondontledings/Soil analyses should coincide with leaf analyses, and be done every second year on sand soils. Take soil samples from the same spot every year, for accurate historic dataset development for the soils. Sampling areas can be marked with GPS coordinates, and sample sections where trees are performing poorly, separately.

Gereelde grondontledings in bestaande boorde verseker die handhawing van optimale groeitoestande, die vermoë om veranderings in grondvrugbaarheid te bespeur en dat daar korrektief opgetree kan word. Dus, vóór die ontwikkeling van voedingsprobleme wat boomprestasie benadeel.

Other analyses Analyse manure or compost to determine the nutrient value and occurrence of unacceptable elements (e.g., heavy metals) in the organic material. The amount of organic material applied is determined by the concentration of nutrients in the compost or manure. The nutrient content of organic material is much lower than inorganic fertilisers, and often in an inappropriate ratio compared to the trees' nutritional requirements. Beware of applying excessive amounts of nutrients that are out of sync with the trees' requirements.

Bemesting/Fertilisation Potential yield is an indicator for fertiliser application quantities. Use historic yield data to determine a realistic target yield and basis from which the fertilisation requirement is compiled. The fertilisation programme should then be adjusted, using the results from both soil and leaf analyses, as well as seasonal evaluations.

The fertilisation programme for each season starts in July or August of the previous year, depending on the production area. 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.

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. Indien nodig, moet beide bespuitings ses tot agt weke voor die 50% blomstadium toegedien word. Dit is meestal Julie of vroeg-Augustus.

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 kleiinhoud 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 tot veel later as Januarie aanhou nie.
Organiese materiaal	Organiese materiaal soos kompos, kraal- of hoendermis moet nie later as Julie of Augustus toegedien word nie. Vrystelling van N uit organiese materiaal is moeilik om te beheer of voorspel en oormatige N-mineralisasie ná Oktober, sal nadelige gevolge inhou.	Die huidige metode is om die totale massa organiese materiaal te verdeel en gelyke massas bo-op elke drupper te plaas. Dit moet teen die laatste gedurende Julie/Augustus gedoen word.
P	Use single or double superphosphate. In higher pH soils it should be applied in a narrow strip of about 5 cm wide in the wetted zone.	Use a water-soluble source like mono ammonium phosphate (MAP). Phosphoric acid can be used in high pH soil, which should be applied in a few instalments from spring onwards (four to five months).
K	Wanneer sproeibemesting gebruik word, kan korrektiewe bemesting op swaarder gronde teen 100 g K per boom per toediening oor die hele lengte van die siklus toegedien word. Doen dit elke twee tot drie weke totdat die voorgeskrewe aanbeveling toegedien is. Wanneer meganies of met die hand uitgestrooi word, word die aanbevole K in een (leem- tot kleigronde) tot drie (sandgronde) toedienings gedurende die lente/vroeë somer gedoen.	Dien die aanbevole massa kaliumnitraat, -sulfaat of -chloried toe oor 'n periode van drie tot ses maande gedurende Julie tot Desember.
Ca	Calcium deficiency is only expected on acidic or extremely sandy soils. The most critical time to avoid a deficiency is from August to October. Therefore, lime applications should be done in winter, while gypsum can be applied up to August or September.	Calcium nitrate is the only suitable alternative source, besides lime and gypsum that require rain to be washed into the soil. It must be applied from July to September/October and can be extended to December. Take the nitrate component of the calcium nitrate into account when calculating N fertilisation.
Magnesium	Dolomitiese kalk, magnesiumsulfaat, -hidroksied of -oksied kan in die lente, vroeë somer of herfs toegedien word.	Magnesiumnitraat of -sulfaat word ook oor 'n periode van drie tot ses maande toegedien. Die nitraat word gewoonlik vroeg, en die sulfaat ná Oktober, toegedien.
Sulphur	Sulphur deficiency has the most devastating effect on fruit set. Where a deficiency is present, apply the sulphate (e.g. gypsum) during July to August. On sandy soils, maintenance applications are done during spring or early summer.	Gypsum is applied in the rainy season. Otherwise, magnesium, potassium or ammonium sulphate are S-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 suurinhoud van die vrugte te verminder kan MAP toegedien word. Om die TOV van die vrugte te verhoog kan MKP toegedien word. Dit sal ook dunner en gladder skille tot gevolg hê.	Ses weke ná blomblaarval. Ses, vier en twee weke voor oes.
K	Potassium nitrate to stimulate blossom or improve the quality of the blossom. Potassium sulphate or potassium nitrate to supplement the K supply, if root uptake is insufficient.	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 tekorte ondervind word. Instandhouding, indien nodig	Julie/Augustus en weer in Oktober. Oktober tot Desember
Cu	Only recommended to correct a deficiency.	May to July, before flowering.

Postharvest pathology (W. du Plooy and L. Mamba)

Even during peak periods, important basic practices like sanitation and fungicide application remain vital in packhouses.

Packhouse sanitation

This practice aims to mainly:

- remove infected fruit from the packhouse environment
- sanitise surfaces with appropriate treatments.

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

Surfaces to consider in sanitation

- **Packline surface** Treat daily with a registered, food-safe sanitising product. It is important that the product does not leave a residue and is quick and easy to use.
- **Fruit surface** Prioritise a fruit disinfectant treatment when entering the packhouse. Chlorine (Calcium Hypochloride) is the most popular active for this purpose. Strictly manage the chlorine concentration, pH and ORP. Alternatives such as liquid or powder PAA formulations can also be used. In the case of PAA there is no need to adjust the pH. However, the PAA concentration levels must be managed carefully, and fruit must be dried timeously (both are to prevent rind injury).
- **Floors and walls** are to be washed weekly with a registered soap and disinfectant product. In these areas, a product that leaves a residue (such as a QAC product) can be used. Use a registered soap before sanitation, as a dirty surface can't be sanitised. The areas to clean include the packhouse, degreening rooms, and cold rooms.
- **Degreening rooms and cold rooms** must to be washed and then – where possible – fumigated with a suitable product that can reach into all crevices. Avoid the risk of residue transfer; never fumigate when there is fruit in the room.
- **Orchard bins and picking bags** Wash and sanitise before re-use.

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Jan Landman

Sources of inoculum (spores)

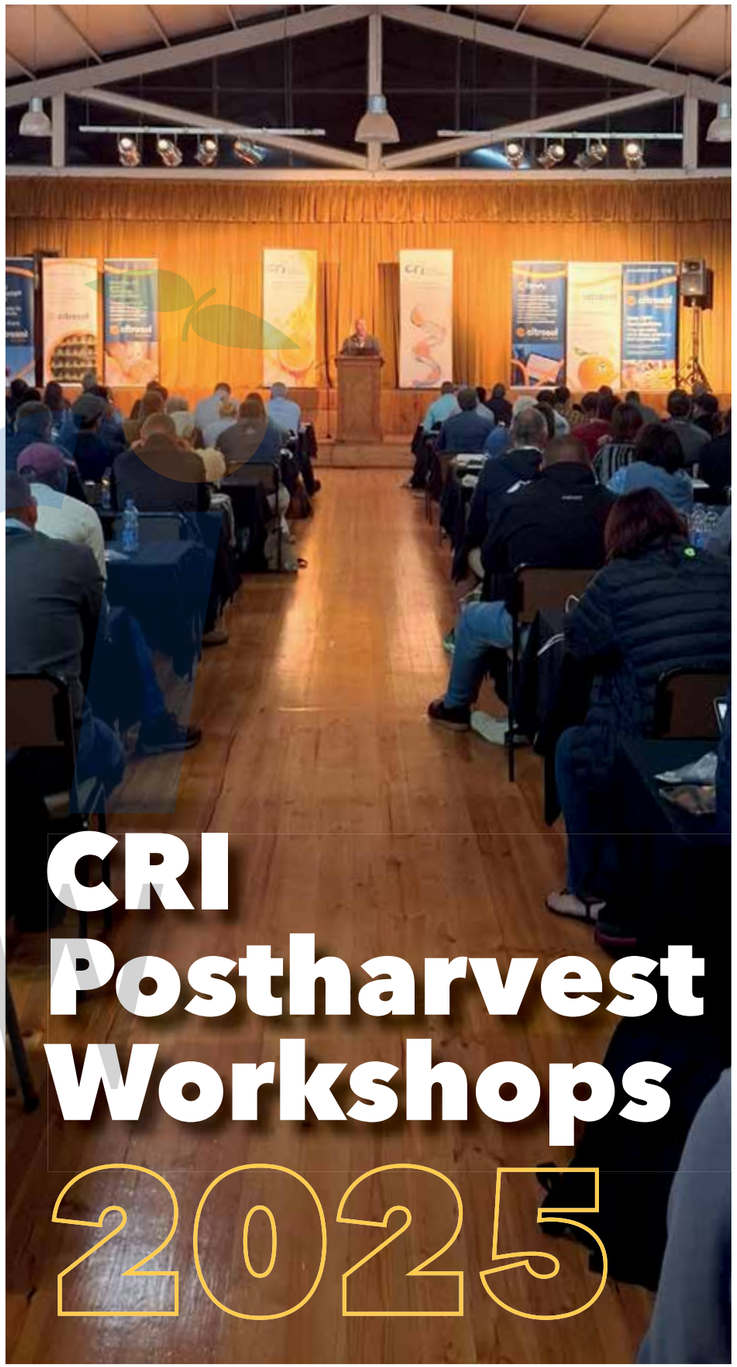
- **Orchard spores** naturally occur in the orchards. So, orchard sanitation is key, to reduce the inoculum load.
- **Post-degreening fruit** Degreening conditions are favourable for disease development and, unfortunately, some sporulating fruit are often tipped into the packhouse system.
- **Waste fruit** Do have a process in place to remove this fruit promptly. Keep the waste in sealed containers.
- Often **juicing fruit** treated with fungicides, lingers in the packhouse area until it's transported to the juicing plant. Therefore, decay on such fruit holds a resistance risk.
- **Small fruit** If not properly graded out, this fruit can fall between brushes, or gaps between units, and lie unseen on drip trays in the packhouse.
- **Retention samples** Shelf-life fruit has also been treated with fungicides and holds a similar resistance risk as juice fruit.

Recommendations for reduced risk of infection or resistance development

- Treat all harvested fruit within 12–18 hours. Most fungicides cannot control infections that are older than a day.
- Drench fruit with fungicide protection on Friday afternoon. Don't wait until Monday.
- Degreen fruit for the absolute minimum period.
- Exceedence of the packline volume limit can cause accelerated agitation and movement of the fruit. This will result in bruising and injuries, and will reduce the efficacy of sanitation and fungicide treatment. Spread the fruit out for optimal treatment.
- Risks related to rushing fruit through the various control points:
  - Chlorine treatment: poor disinfection, spores surviving.
  - Fungicide dip tank: loading sub-optimal residue, poor infection control.
  - Wax applicator: poor wax deposition on the fruit; sub-optimal residue loading, poor moisture retention, negative impact on quality.
- Limit the time from harvest to packing and the eventual introduction to the cold chain.

Advice for managing retention fruit

- Have a dedicated task manager.
- Evaluate fruit daily, noting decayed fruit on the carton, then remove or isolated it. Plus:
  - Immediately place infected/discarded fruit in a tightly sealed plastic bag to reduce the risk of releasing inoculum (spores) into the packhouse atmosphere.
  - Green mould sporulation inhibition is a very important criterion to note. Loss of sporulation inhibition indicates either fungicide resistance or poor application. Prevent spore spread by keeping fruit that exhibit sporulation inhibition – white mycelium with few to no green spores – in sealed transparent plastic bags and incubating it for another week for assessment.
  - After the sporulation inhibition rating 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 and completely enclosed with controlled access. Clean and treat this room with a suitable soap and sanitiser at least once a month.



Delegates had waited 12 months for this key industry event

Once again, the annual regional CRI Postharvest Workshops were a resounding success.
By Rudolph Strydom

This year, the regional CRI Postharvest Workshops had a packed venue at each of the six locations visited across the country during January and February. A total of 1 200 delegates attended, representing a wide range of sectors within the citrus industry, from packhouse managers and staff to exporters and agrochemical representatives.

Notably, there's a rise in attendance by the young demographic. This and the overall upward growth trajectory of the citrus industry of Southern Africa make for a promising future.

There's a rise in attendance by the young demographic.

Among the numerous speakers were researchers and experts from various fields, who presented valuable information on market access, export logistics, disease control, and packhouse process optimisation. This year, Citrosol was the main sponsor with various other platinum, gold, silver, and bronze sponsors who also contributed.

SESSIONS

1 Covered everything related to the broader citrus industry and some of the national and global factors that impact it. An area representative provided an overview of the 2024 packing and export season, followed by the main sponsor, who discussed some of the products and services they offer. This was followed by presentations on current market access requirements and ways to decrease packing costs and expenses by improving farm and