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H.F. LE ROUX & J.J. BESTER

Citrus Research International

INTEGRATED PEST MANAGEMENT

CITRUS THRIPS (T.G. GROUT)

Suppressing citrus thrips populations on the spring growth flush will assist in lowering populations experienced at petal fall. On younger trees a methamidophos stem treatment is a useful option for this. An alternative may be an organophosphate that cannot be sprayed after petal fall. Try to avoid using abamectin or tartar emetic which are good options for citrus thrips control in summer.

VALSKODLINGMOT (J.H. HOFMEYR)

Boordsanitasie is 'n ononderhandelbare deel van VKM-onderskudding. Alhoewel dit in die verlede baie afgeskeep is, het produsente die afgelope paar jaar boordsanitasie oor die algemeen met groter ywer begin toepas en amper sonder uitsondering die vrugte van hul pogings letterlik gepluk! Ongelukkig word boordsanitasie nog steeds afgeskeep sodra oestyd begin. Dit is noodsaaklik om boordsanitasie deurentyd toe te pas aangesien besmette vrugte dié tyd van die jaar tot groter VKM-bevolkings die volgende seisoen kan bydra. Moenie vergeet om afgevalde en besmette vrugte ook in Valenciaboorde te verwyder en vernietig nie.

CROP AND FRUIT QUALITY MANAGEMENT (J.S. VERREYNNE)

Maturity indexing on late cultivars in late areas 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 and post harvest 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. Cronje are a must for any grower. Both are available from CRI. Contact Bella Thulare at 013 759 8000 or bella@cri.co.za.

Pruning of early and late cultivars should

be done during this period as soon as possible after harvest. Prune more heavily after a light crop if a heavy crop is expected and when the orchard has a history of alternate bearing. Pruning in the winter and not later than September improves the light distribution inside the tree and improves the quality of the bearing wood inside the tree. Pruning can also be used as a thinning technique. Light levels of 30% of full sunlight are necessary for optimal photosynthesis and light also improves colour development. In very dense trees and especially older trees light levels drop to below 30% inside the tree and adversely affect fruit size.

One or two **pre-bloom foliar urea** applications (low biuret urea at 1%) should be applied for uniform flowering and fruit set, especially when leaf N levels are low and a light blossom is expected.

Fruit set treatments according to cultivar requirements need to be applied. Specific treatments include the application of gibberellic acid (GA) and girdling, especially for parthenocarpic cultivars that have a poor set. Girdling during full bloom improves set. A general guideline cannot be given as fruit set treatments differ by cultivar and, in many cases, by orchard depending on the previous crop load. Moisture stress should be avoided during full bloom, fruit set and early fruit growth.

GEÏNTEGREERDE BEMESTING (J.G.K. COETZEE)

(If you would like to receive this communication in English, please send your e-mail details to jgk@telkomsa.net)

Benutting van kunsmis kan in baie gevalle verbeter word, deur onder andere aan die volgende aandag te gee.

Algemene aspekte Dien slegs toe wat werklik nodig is. Onthou die bome benut die voedingstowwe in die grond en water en net dit wat dan nog kortkom om hul behoeftes te bevredig, moet met kunsmis aangevul word. Daarom is dit noodsaaklik om blaar- en grondontledings en vir hidroponika ook waterontledings te laat doen.

Stikstof Stikstof moet elke jaar aan feitlik alle sitrusboorde toegedien word. Teoreties is al die bronne ewe effektief mits hul reg aangewend word. Om dit reg aan te wend, moet op die volgende "swak punte" van die verskillende stikstofbronne gehou word. Die grootste verlies van stikstof kom voor as gevolg van vervlugging en logging.

Vervlugging Vervlugging vind plaas indien ammonium-



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bevattende kunsmis aan 'n hoë pH-omgewing, veral op oppervlak van die grond, blootgestel word. Hoe meer ammonium 'n misstof bevat en hoe langer dit op die oppervlak gelaat word hoe groter die verlies deur vervlugting. Verliese is noemenswaardig wanneer die pH(water) van die grond meer as 7,50 is. Ureum skep sy eie alkaliese omgewing wanneer dit na ammoniumkarbonaat omgeskakel word en moet dus ook nie te lank op grond, selfs met 'n neutrale pH, gelaat word nie.

Loring Die meeste verliese aan stikstof geskied weens logging tot onderkant die effektiewe wortelsone. Die klei in gronde kan katione soos ammonium vas hou en teen logging beskerm, maar die vermoë om anione te adsorbeer is meestal baie laag. Daarom sal nitrate makliker as ammonium loog. Ureum dra aanvanklik geen lading nie maar word vinnig na ammonium omgeskakel. Die paar dae na die toediening van ureum is dit dus baie aan logging onderworpe.

Wanneer stikstof in Julie, Augustus en September toegedien word, neem die bome nie alles dadelik op nie. Daarom is dit uiters belangrik dat die besproeiing deur mikro-spuite wat net na die toediening volg, nie so swaar is dat die stikstof dieper as 20-30 cm indring nie. Ook al die ander besproeiings gedurende Julie tot September/Oktobre moet versigtig gekied sodat die stikstof nie uitwas nie. Wanneer druppers gebruik word, moet elke besproeiing beheer word sodat nie dieper as die boonste 70% van die wortelsone benat word. Te lang staantye vermors water en kunsmis.

Verdeelde toedienings van stikstofbronne word effektief gebruik om die verliese aan logging te beperk. Hoe meer sand-erig 'n grond, hoe kleiner moet elke toediening wees.

Ureum bevat 46% stikstof en behoort die goedkoopste bron, op die plaas gelewer, te wees. Ureum se swak punte is verliese deur vervlugting en logging.

Ureumammoniumnitraat (UAN) bevat 420 g N per liter waarvan die helfte in die vorm van ureum en die res as ammoniumnitraat voorkom. UAN se swak punte is verliese deur vervlugting en logging.

Kalksteenammoniumnitraat (KAN) bevat 28% N waarvan die helfte in die vorm van nitraat is. KAN se swak punt is veral logging van die nitraat-gedeelte.

Ammoniumsulfaat bevat al die stikstof in die vorm van ammonium.

Versuring Wanneer te veel van die goedkoper ammoniumstikstof by druppers gebruik word, versuur die wortelomgewing vinnig. Onder suurtoestande verloor die wortels hul effektiwiteit om water en voedingstowwe op te neem. Dit sal dus nodig wees om die duurder nitrate te gebruik om die optimale pH te handhaaf. Versuring vind ook plaas waar mikro-spuite gebruik word.

Wanneer die pH (water) van die grond onder 6,0 daal moet kalk (by mikro-spuite) of meer nitrate (druppers) toegedien word.

Fosfor Die grootste probleme met fosfate is oplosbaarheid en beweging. Die wateroplosbare vorm wat plante kan benut, beweeg baie min deur die grond. Selfs mono-ammoniumfosfaat (MAP) en fosforsuur beweeg min. Waar mikro-spuite gebruik word, is die beste opsie om superfosfaat te bandplaas en nie uit

te strooi nie. MAP kan egter nie gebandplaas word nie. Fosfate soos skulpgruis, beenmeel en rotsfosfaat kan ook nie gebandplaas word nie. Die kontak met die grond en hul oplosbaarheid is te swak om van veel nut te wees. Met druppers moet die fosfor oor periodes van 2 tot 4 maande teen lae konsentrasies toegedien word.

Kalium Die opname van kalium deur sitrus word deur faktore soos klei-inhoud, konsentrasie magnesium, kationverhoudings en pH van die grond beïnvloed. Voordat kalium aan die grond toegedien word, moet hierdie faktore en die kaliumstatus van die bome geëvalueer word. Blaarbespuitings met kaliumnitraat of -sulfaat mag dalk meer doeltreffend wees.

Blaarbespuitings Suksesvolle blaarvoeding hang van drie basiese vereistes naamlik konsentrasie, kontaktyd en formulasie af.

Konsentrasie Omdat die inhoud van die elemente in die blare verhoog moet word, is 'n sekere massa van die betrokke element daarvoor nodig. Byvoorbeeld, indien die konsentrasie sink van 20 na 40 mg per kg verhoog moet word, moet 20 mg sink vir elke kg blare opgeneem word. Die doeltreffendheid is egter selde 100% daarom moet minstens twee keer soveel toegedien word. Indien die konsentrasie van die oplossing wat gespuit moet word, egter te laag is kan dit fisies nie bereik word nie.

Die effektiewe konsentrasie van sink is 80 tot 100 mg Zn per liter spuit-oplossing en die van boor 300 tot 400 mg per liter. Bereken die konsentrasie na verdunning en besluit dan op die beste bron.

Kontak-tyd Plante kan net voedingstowwe absorber wat in oplossing is. Daarom moet die blare so lank moontlik met

die spuit-oplossing nat bly. Kontaktyd word bepaal deur die grootte van die druppels, humiditeit en temperatuur. Spuit dus vroeg in die oggend of laat in die middag of nog beter gedurende die nag.

Formulasie Plante benodig die voedingselemente in spesifieke vorms en hierdie vorms is die eenvoudige anorganiese ione. Formulasie wat die nadele van te hoë pH van die water, verlengde kontaktyd en die proses van opname kan bevorder, kan egter soms voordelig wees. Nietemin, is die anorganiese formulasies wat teen hoë konsentrasies gespuit kan word, meestal suksesvol.

GRONDGEDRAAGDE SIEKTES (M.C. PRETORIUS)

Aalwurms Grond- en wortelmonsters kan nou in die lente getrek word en na die Diagnostiese Sentrum in Nelspruit gestuur word vir ontleding sodat die aalwurmpopulasie status in die wortels bepaal kan word. Die resultaat sal dien as 'n bestuurshulpmiddel om 'n koste doeltreffende aalwurmbeheerstrategie daar te stel.

Die gebruik van chemiese aalwurmdoders, Temik uitgesluit, vir die beheer van die sitrusaalwurm word nie aanbeveel alvorens ten minste 30 mm reën geval het nie (Oktober). Elke aalwurmdoertoeiening behoort met 'n behoorlike besproeiing opgevolg te word om daardeur te verseker dat die middels deeglik in die grondprofiel in gewas word. *Toedienings behoort slegs volgens etiketaanbevelings toegedien te word. Afwykinge van die geregistreerde dosisse, om kostes te bespaar, is glad nie 'n effektiewe benadering nie. Dit is belangrik om 'n program te volg, een aalwurmdoder toediening per seisoen is 'n mors van geld!*

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Phytophthora *Phytophthora* wortelvrot – die gebruik van fosfaat produkte is 'n uiters effektiewe en bekostigbare beheermaatreël wat suksesvol deur produsente gebruik word. Dit is van uiterste belang dat die etiket deeglik bestudeer word asook die waarskuwings voordat die produk gebruik word om effektiwiteit te verseker en fitotoksiteit te voorkom. Indien kraagvrotletsels voorkom kan 'n stamverf/blaarbespuiting aangewend word, drie aanwendings per seisoen met 6-8 weke intervalle. Vir wortelvrotbeheer word drie blaarbespuitings, met 6-8 weke intervalle aanbeveel.

FRUIT AND FOLIAR DISEASES (G.C. SCHUTTE)

Alternaria core rot *Alternaria* core rot, also known as navel-end rot and black rot, occurs in all areas of southern Africa. The disease is most prevalent on those citrus cultivars such as navels and Clementines characterised by the presence of a secondary fruit called the fruit-navel, which varies in size and develops at the stylar end of the primary or main fruit. These fruitlets are extremely sensitive to environmental stress conditions during early stages of development and are therefore also prone to diseases such as navel-end rot and physiological disorders.

Alternaria core rot is linked to large fruit-navels or to the abnormal growth of the secondary fruit into primary-fruit locules which lead to the formation of points of entry through which fungi can penetrate to form infections which remain quiescent until favourable conditions stimulate further fungal growth.

The style and stigma of navel blossoms are milky white at first and then turn light brown in colour and abscise cleanly. This happens one week after petals have dropped and young fruit are ± 8 mm in size. The two sets of stylar tissue present in the primary and secondary fruit locules can be injured during the blossom period if harsh weather conditions prevail for one or more days (hot days $>25^{\circ}\text{C}$), and low relative humidity ($<20\%$) followed by heavy dew during the evenings. This causes the outer or primary style to turn brown and dry out, while the inner or secondary style remains unaffected inside the outer style and continues to develop and swell in size to result in longitudinal cracks in the outer tissue. The longitudinal cracks enlarge as the orange increases in size. The inner ovary projects even more as the orange approaches maturity. This results in a large, irregular-shaped navel-end and creates an ideal site for *Alternaria* infections.

Score (50 ml/100 l water) and Folicur (80 ml/100 l water) are registered for control of the disease.

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

Post-harvest decay warning Intermittent rainfall in the summer rainfall production areas and rain in the winter rainfall production areas during the season could lead to the following problems:

- High pathogen inoculum levels in orchards on all surfaces resulting in
- Infections by latent pathogens – Anthracnose, Diplodia Stem end rot and Phomopsis stem end rot.

- Infections by wound pathogens – green and blue mould and sour rot.
- Infections by soil pathogens – *Phytophthora* brown rot.

PRECAUTIONS

- 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.

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.
- Spray contact fungicides only (copper at 200 g per 100 l) as a preventive measure against *Phytophthora brown rot* after rainfall. Contact fungicides must be resprayed after any follow-up rainfall.
- Foliar applications of Phosphonates for the control of Root and Collar rot will be effective against brown rot.
- If fruit fly baits must be applied shortly after spraying copper use GF-120 rather than protein hydrolysate as it is less likely to cause fruit burn.

DO NOT WASTE TIME AND MONEY - SPRAYING SPOREKILL ALONE FOR BROWN ROT. SPOREKILL ALONE HAS NO EFFECT AGAINST BROWN ROT.

PACKHOUSE

Ensure that packhouse chemicals are applied at recommended concentrations and packhouse procedures and critical control points are managed diligently. Pack very strictly with regard to injuries, creasing, over mature fruit, etc.

IMPORTANT POINTS TO REMEMBER

- All damaged fruit are HIGH RISK for export.
- Latent and wound pathogen infections on the tree lead to further development of latent pathogen infections, and the spread of wound pathogen infections in exported cartons.
- Over-ripe fruit past optimum internal quality, that are destined for markets requiring cold disinfestations, are less resistant to cold damage during storage/shipping and more susceptible to decay.
- Minimise the delay between picking and packing.
- Fruit arriving in the market with quality problems often sells at reduced prices and ultimately becomes a major loss for the grower.

PRODUCERS MUST BE AWARE OF THE RISK INVOLVED IN EXPORTING THIS FRUIT AND DECIDE WHETHER TO EXPORT THE FRUIT, OR NOT.