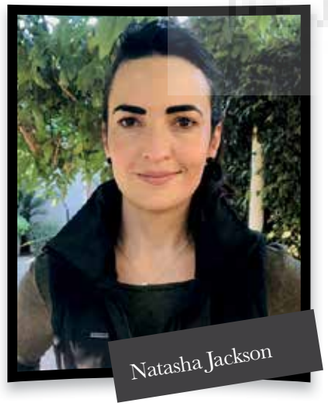
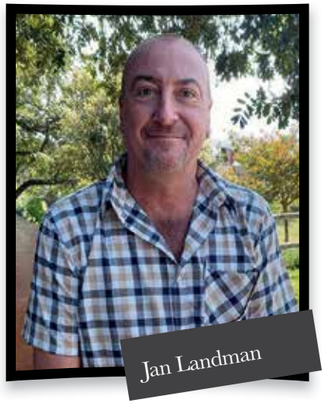
macerated route is followed, the fruit should be cut into fine pieces and allowed to dry in the sun away from the orchards and packhouses. Fallen and injured fruit removed from the orchard fruit can also be used as animal feed. Remember to follow the FMS guidelines and examine a sample of the sanitation fruit if you export to the EU. The FMS can be found on CRI's website under "member downloads" and all changes will be communicated via CRI's Cutting Edges.

**Skirt trees for sour rot and brown rot control:** Ensure that trees are adequately skirted before the tree starts bearing, to prevent low-hanging fruit, especially for


Catherine Savage


Natasha Jackson


Jan Landman

heavily laden trees where fruit will be touching the ground or be in range of water splash. This practice will reduce the risk of *Phytophthora* brown rot infection during the rainfall season as well as sour rot (*Galactomyces* spp.) infection. Keep in mind that no pre-harvest fungicides are available to adequately control sour rot, so orchard sanitation and skirting are crucial. Remove dead wood from all citrus trees to reduce the spore load of the latent citrus pathogens.

**Prevent injuries:** Ensure that picking teams are trained to focus on the prevention of injuries. Avoid snap picking, unless pickers have mastered the technique and the fruit is not to be exported. Injuries are the number one cause of postharvest decay. Keep in mind that some markets may be stricter on the stem end length, so ensure pickers cut the stem end as short as possible, without damaging the rind.

**Packhouse sanitation:** Before any fruit is brought to the packhouse in the new season, the entire building and line need to be thoroughly cleaned. Use an appropriate sanitiser to clean everywhere from the roof to the floor, including walls and hard-to-reach nooks and crannies.

- Never allow any fruit – and more importantly, any fungicide-treated fruit – to lie around in the packhouse at any stage during the packing process.
- Spray the packhouse regularly with sanitisers, and immediately after finding even just a single rotten fruit.
- Constantly monitor concentrations of sanitisers in dump tanks, sprays, rinses, etc. and ensure that these sanitisers are being used according to the correct specifications (e.g. pH).
- Wash equipment such as trailers and harvesting bins with a suitable sanitiser before they leave for the orchard.
- Ensure that packed cartons are cooled as soon as possible to prevent decay development.
- Store retention samples for each consignment and check them regularly for waste and other developing factors, such as pitting, rind break down and latent pathogens. Keep track of other defects such as wind, thrips and mechanical damage.

**Selection of fungicides:** For many packhouses, the chemicals that will be used during the upcoming season are being sourced and negotiated. Decide on a chemical programme that is in line with decay control and export market regulations. Make use of the CRI Postharvest Factsheets that are available online at www.citrusres.com under the "member downloads". If using a new product, ensure that it is safe for use (possible phytotoxicity; MRL restrictions) and that it is applied correctly. Also keep in mind which cleaning protocol must be followed if you need to strip the line of residues that have been used, but are no longer allowed. See Cutting Edge No. 314 published by CRI, available on www.citrusres.com.

In light of the increased cold-temperature shipping and FMS protocols, it is important that packhouses use thiabendazole (TBZ) for all fruit being exported. TBZ applied in the wax, provides protection against chilling injury and is also very important to help control latent pathogen infections. A high solid wax (20 - 22%) will also aid in preventing chilling injury.





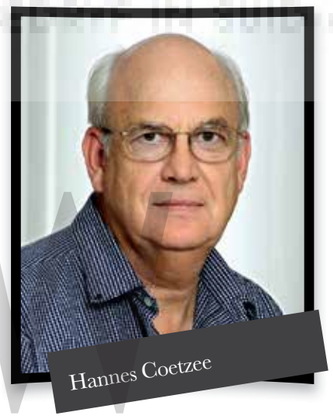
# Useful recommendations regarding foliar nutrition of citrus

Effective use of foliar nutrition of citrus orchards requires correct application practices. By **Hannes Coetzee** (JGK Consulting) and **Pieter Raath** (CRI)

This article provides a summary of guidelines that must be followed for successful foliar nutrition applications.

## Concentration of application

Refer to **Table 1** for the minimum effective, and highest safe concentration at which the different nutrients (and products) should be applied. Products must be applied at this appropriate concentration.


Hannes Coetzee


Pieter Raath

## Contact time

To avoid run-off loss of the spray mixture, apply 10 ℓ spray mixture per mature tree, for maximum uptake. Use the following guidelines to obtain maximum contact time between the spray mixture and the leaves.

**Table 1**

| | | | |
|---|---|---|---|
| **Optimal droplet size:** | Pressure < 8 bar | Whirl plate 56 | Orifice of spray nozzle = 2.3 mm Ø |
| **Climatic conditions:** | Humidity as high as possible | Temperature as low as possible but above freezing point | |

## Formulation

Note that in **Table 1** the proven and effective products are listed. Amongst the formulations tested by Van der Merwe (2016), the inorganic salts ($SO_4^{2-}$ and $NO_3^-$ formulations) were found to be most beneficial if both efficacy and cost are considered.

## Additives

Only use additives that will increase the contact surface between droplet and leaf. Do not use surfactants that will decrease volume load on the leaf, or result in small drop sizes that cause rapid drying off.

Apply cations (K, Mg, Cu, Mn and Zn) at a pH of 5.5 to 6.5, and apply P at a pH of 3.0 to 4.0; and use a pH buffer when required.

## Simultaneous application of micronutrients

Below, a mixture that will ensure efficient, cost-effective simultaneous application of all the micronutrients is provided, but apply only those required as indicated by leaf analysis.

**Table 2**

| | | | | | |
|---|---|---|---|---|---|
| **Compound in mixture:** | LB Urea | $ZnSO_4$ | $MnSO_4$ | Copper oxychloride | Solubor |
| **Dosage (g/100 ℓ):** | 500 | 100 | 100-200 | 75 | 150 |

## References

Coetzee, J.G.K. 2007. Fertilisation of Citrus. CRI Citrus Production Guidelines, Vol. 2. CRI, Nelspruit.

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Peryea, F. J. 2006. Phytoavailability of zinc in post bloom zinc sprays applied to "Golden Delicious" apple trees. *HorTechnology* 16(1), 60-65.

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