



## Reduction of navel-end opening size and Alternaria black core rot

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### Background

Research has demonstrated that the use of 2,4-D in foliar spray applications during flowering time can reduce the size of the navel-end opening of Navel orange fruit. A 2,4-D treatment applied at the correct timing, can be a cost-effective and reliable method to reduce fruit drop and increase fruit yield. Until recently, 2,4-D was not permitted for pre-harvest use in citrus production in South Africa, and no registration was available for foliar application to Navel orange trees.

A research project by CRI investigated the possibility of a safe foliar spray treatment of 2,4-D for growers to apply during flowering at the right concentration, timing and volume, conditional to registration approval. The following were the main findings:

- Foliar application of 20 ppm 2,4-D (the concentration used in earlier experiments on Navels) to Navel oranges during full bloom (FB) increased the percentage of fully closed navel-ends and reduced the size of those that were open.
- The result was consistent in three citrus production areas, viz. Kirkwood, in the Eastern Cape, Heidelberg and Citrusdal in the Western Cape, and Marble Hall and Nelspruit in Mpumalanga.
- Effects of 2,4-D on the navel-end were consistent in different seasons, as well as in five different Navel orange cultivars: 'Washington', 'Robyn', 'Lane Late', 'Cambria' and 'Autumn Gold'. Both the dimethyl-amine salt and the iso-octyl ester formulations were effective, independent of the dosage rate used.
- When 10 ppm 2,4-D (half the concentration of prior experimental dosage) and 80 mL/100 L tebuconazole were applied as a combined foliar spray, a synergistic response was obtained which resulted in a higher percentage fruit with closed navel-

ends compared to both the untreated control or the stand-alone 2,4-D treatment (20 ppm) applied at FB.

- The combination treatment of 10 ppm 2,4-D and 80 mL/100 L tebuconazole in one foliar spray provided better control for Alternaria black core rot (ABCR) infection compared to two foliar sprays of tebuconazole at 80% and 100% petal drop, which is the current standard commercial control for ABCR in navels.
- The effect of 2,4-D on the navel-end provided a physical barrier against fungi penetrating the fruit, while the addition of tebuconazole provided a systemic control action.
- The lower dosage of 2,4-D (10 ppm vs. 20 ppm) resulted in no residues exceeding any of the permitted maximum residue levels (MRL's) for the various exporting countries, and no phytotoxicity was observed on any of the treatments, viz. no leaf curling or granulation.
- A closing of, or reduction in the navel-end opening by 2,4-D was in most instances correlated with a reduction in mealybug infestation at harvest time. The reduction in refuge space for mealybugs will tend to increase the level of their control, both biologically through parasitoids, and through more efficient chemical control. Mealybugs are known to promote ABCR infection and the chemical reduction or elimination of navel-ends by 2,4-D, together with the addition of tebuconazole at full bloom, provides for improved control of both the mealybug pest and the ABCR disease.

### Recommendation

AVIMA has obtained a registration of the treatment for use as a pre-harvest foliar spray. A combination treatment of one foliar application of 1.3 mL/100 L water Avi-amine [2,4-D amine 720 SL (Avima)] and 80 mL/100 L water Tebucure [tebuconazole 250 EW (Avima)] at FB has been registered for use in Navel oranges to reduce the navel-end opening and ABCR infection. The product is sold in ready-to-mix packs for 1000 L water, minimising risk of



error associated with measurements. The use of any other form of 2,4-D is still unregistered and not permitted for use in citrus as a pre-harvest treatment. Treatment should be applied as a medium-cover foliar spray, not exceeding 4000 L/ha. The application of tebuconazole at 80% and 100% petal drop is still an alternative method to control ABCR.

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**Figure 1.** The correct timing at which the treatment should be applied.



## Reduksie van die nawel-end grootte en Alternaria kernverrotting

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### Agtergrond

Navorsing het getoon dat die gebruik van 2,4-D in blaarbespuitings tydens blomtyd die grootte van die nawel-end opening van Nawel lemoene kan verklein. 'n 2,4-D behandeling op die korrekte tyd kan 'n koste-effektiewe en betroubare metode wees om vrugval te verminder en vrugtopbrengs te verhoog. Tot onlangs is 2,4-D nie toegelaat vir gebruik in sitrusproduksie in Suid-Afrika nie, en daar was geen registrasie beskikbaar vir 'n voor-oes blaarbespuiting op Nawel lemoenbome nie.

'n Navorsingsprojek deur CRI het die moontlikheid ondersoek vir 'n veilige blaarbespuiting van 2,4-D teen die regte konsentrasie, tydsberekening en volume blaarbespuiting, onderhewig aan die suksesvolle regisstrasie van die behandeling. Die volgende was die belangrikste bevindinge:

- Blaarbespuiting van 20 dpm 2,4-D (die konsentrasie wat vroeër in eksperimente gebruik is in Nawels) in Nawel lemoene tydens volblom (VB) het die % van ten volle geslote nawel-ente verhoog en die grootte van die wat oop was verklein.
- Die resultaat was konsekwent in drie sitrusproduksie gebiede, nl. Kirkwood, in die Oos-Kaap, Heidelberg en Citrusdal in die Wes-Kaap, en Marble Hall en Nelspruit in Mpumalanga.
- Effekte van 2,4-D op die nawel-ent was konsekwent in verskillende seisoene, asook in vyf verskillende Nawel kultivars: 'Washington', 'Robyn' 'Lane Late', 'Cambria' en 'Autumn Gold'. Beide die dimetielamien sout en die iso-oktiel ester formulerings was effektief, onafhanklik van die dosis gebruik.
- Wanneer 10 dpm 2,4-D (die helfte van die konsentrasie van vroeër eksperimentele toedienings) en 80 ml / 100 L tebukonasool in een blaarbespuiting toegedien is, is 'n sinergistiese reaksie verkry wat tot 'n hoër % vrugte met geslote nawel-ente gelei het,

in vergelyking met die onbehandelde kontrole of die VB 2,4-D behandeling teen 20 dpm alleen toegedien.

- Die kombinasie behandeling van 10 dpm 2,4-D en 80 ml / 100 L tebukonasool in een blaarbespuiting het beter beheer verleen vir Alternaria kernvrot (ABCR) infeksie in vergelyking met twee blaarbespuitings tebukonasool teen 80% en 100% blomblaarval, wat die huidige standaard kommersiële beheer vir ABCR in nawels is.
- Die effek van 2,4-D op die nawel-end het 'n fisiese versperring verskaf teen swamme wat die vrug binnedring, terwyl die toevoeging van tebukonasool 'n sistemiese beheeraksie verskaf het.
- Die laer dosis 2,4-D (10 dpm vs. 20 dpm) het geen residu's opgelewer wat enige van die toegelate maksimum residuvlakke (MRL's) vir die verskillende uitvoerlande oorskry het nie en geen fitotoksiteit is waargeneem op enige van die behandelings, nl. geen blaarkrul of granulasie.
- 'n Toemaak of vermindering in die nawel-end opening met 2,4-D was in die meeste gevalle gekorreleer met 'n vermindering in witluisbesmetting tydens oestyd. Die vermindering in toevlugsoord vir witluis sal geneig wees om die vlak van hul beheer te verhoog, beide biologies deur parasitoïede en meer doeltreffende chemiese beheer. Witluis is bekend om ABCR-infeksie te bevorder en die chemiese vermindering van eliminering van nawel-ente met 2,4-D, tesame met die toevoeging van tebukonasool by volblom, bied verbeterde beheer van beide die witluisplaag en die ABCR-siekte.

### Aanbeveling

AVIM het 'n registrasie verkry vir hierdie voor-oes blaarbespuiting. 'n Kombinasie behandeling van een blaarbespuiting van 1,3 ml / 100 liter water Aviamien [2,4-D amien 720 SL (Avima)] en 80 ml / 100 L water Tebucure [tebukonasool 250 EW (Avima)] by VB is geregistreer vir gebruik in Nawel lemoene om die nawel-end opening en ABCR infeksie te



verminder. Die produk word in gereed-tot-meng-pakke verkoop vir 1000 L water, wat die risiko van foute wat met metings geassosieer word, verminder. Die gebruik van enige ander vorm van 2,4-D is steeds ongeregistreer en word nie toegelaat vir gebruik in sitrus as 'n voor-oesbehandeling nie. Behandeling moet toegedien word as 'n mediumdek blaarbespuiting wat nie 4000 L / ha oorskry nie. Die toediening van tebukonasool teen 80% en 100% blomblaarval is steeds 'n alternatiewe metode om ABCR te beheer.

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**Figuur 1.** Die korrekte tyd wanneer die behandeling toegedien moet word.