Cutting Edge
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pH Adjustment in the imazalil hot water bath

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At the recent pre-season Citrus Packhouse Workshops one of the main focus areas during the postharvest presentations was the application of imazalil in the hot water bath in citrus packhouses. History has demonstrated that the residue levels of the compounds (specifically **imazalil**), that were retained on fruit applied in the bath, were too low i.e. < 1.0 mg/kg.

This resulted in three major issues:

- **imazalil** was not able to inhibit sporulation of *Penicillium* infections (green and blue mould).
- High waste levels on arrival of fruit in the markets.
- Selection for resistant *Penicillium* populations.

The imazalil sulphate formulation used in the bath (imazalil sulphate 750 WSP or WG) is highly acidifying and once added to the bath the pH drops to a pH of around 3.0. Apart from other important factors such as exposure time (ideally 1 min) and water temperature (ideally 30-35℃), imazalil residue loading onto fruit is more effective at pH levels of 6 to 7.0. Research at Stellenbosch University has demonstrated the importance of efficient imazalil residue loading, especially in terms of sporulation inhibition and control of imazalil resistant strains. However, this ongoing research also warned that imazalil MRL levels can be exceeded through relatively short exposures in high-pH imazalil solutions. CRI researchers and representatives of the agrochemical industry are presently working toward a reliable recommendation to adjust pH of imazalil baths. However, given the big variation in water quality between citrus production areas, this is not an easy task, especially as it has become clear that the water soluble imazalil sulphate solution dissociates into its oily freebase form in alkaline solutions (pH > 7, depending on water quality).

There are still a number of unknowns as far as the pH adjustment method is concerned. These issues still need to be investigated before a revised recommendation is made in the industry. In the meantime, please consider the Production Guidelines and take care when adjusting the pH in imazalil baths to levels where imazalil sulphate precipitation should not occur (pH < 6). Note that this pH level might differ between packhouses and over time depending on the quality of water and combination of products used in the fungicide bath. Therefore, first adjust the pH of a 1-litre sample from the imazalil bath to get a clear indication at what pH level imazalil precipitation (when the solution starts to turn milky) occurs, and secondly (on a new 1-litre sample) to determine the correct amount of NaOH needed to adjust the bath to a pre-precipitation pH level.

Packhouses using imazalil in the bath must continue applying imazalil and managing the application as indicated in "Cutting Edge #62", and also attempt to achieve an exposure rate of ideally 1 minute.

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Aanpassing van die imazalil pH in die warm waterbad

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Gedurende die aanbiedinge tydens die onlangse voor-seisoen Sitrus Pakhuiswerkswinkels, was die aanwending van imazalil in die warmwaterbad in sitruspakhuise een van die belangrike fokus punte. Geskiedenis het gewys dat die residuvlakke van die swamdoders (veral imazalil) op vrugte uit die bad te laag was; dws < 1.0 mg/kg.

Dit het drie belangrike probleme veroorsaak:

- imazalil kon nie sporulasie van *Penicillium* infeksies (groen- en blouskimmel) inhibeer nie.
- Hoë vlakke van bederf tydens aankoms van vrugte in die market.
- Seleksie vir bestande *Penicillium* rasse.

Die imazalil formulasie wat in die bad gebruik word (imazalil sulfaat 750 WSP of WG) versuur die bad en sodra dit gemeng word daal die pH af na om en by 3.0. Buiten belangrike faktore soos blootstellingstyd (ideaal 1 min) en watertemperatuur (30-35°C), is imazalil residu-lading meer effektief teen 'n pH van 6 tot 7.0. Navorsing op Stellenbosch Universiteit het die belangrikheid van effektiewe imazalil lading, in terme van sporulasie inhibisie en die beheer van imazalil bestande-rasse, gewys. Hierdie aangaande navorsing het nietemin gewaarsku dat die imazalil residuvlakke, deur betreklike kort blootstelling in hoë pH imazalil oplossings, die imazalil MRL vlak van 5 dpm kan oorskry . CRI navorsers en verteenwoordigers uit die landbouchemikalie bedryf werk huidiglik aan 'n betroubare metode om pH in die imazalil baddens aan te pas. Nietemin, weens die groot verskeidenheid in watergehalte in die sitrusproduksiegebiede, is hierdie nie 'n eenvoudige taak, veral omdat dit nou duidelik geword het dat die wateroplosbare imazalil sulfaat in alkaliese oplossings (pH >7.0, afhangende van die watergehalte), tot sy olierige vrybasis vorm ontbind.

Daar is nogsteeds verskeie onbekende faktore rakende die pH aanpassingsmetode. Hierdie kwessies moet nog ondersoek word voordat 'n hersiene aanbeveling aan die bedryf gemaak word. Verwys dus intussen na die Produksieriglyne en wees versigtig sodat pH tot vlakke aangepas word waar imazalil sulfaat ontbinding nie plaasvind nie (pH < 6.0). Neem kennis dat dié pH vlak dalk tussen pakhuise mag verskil, afhangende van die watergehalte en kombinasie van produkte wat in die swamdoderbad gebruik word. Dus moet die pH van 'n 1 liter monster uit die imazalil bad eers aangepas word. Dit sal eerstens wys teen watter pH vlak die imazalil sulfaat ontbinding (sodra die oplossing melkerig word) plaasvind, en tweedens (met 'n ander 1 liter monster), aandui wat die regte hoeveelheid NaOH benodig is om die bad se pH vlak reg te stel.

Pakhuise wat imazalil in die bad gebruik moet die aanwending bestuur soos in "Snykant #62" aangedui, en ook poog om 'n blootstelling tyd van ideaal 1 minuut te bereik.