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Hydrochloric acid (HCl) shortage in South Africa

Wilma du Plooy and Catherine Savage,
Citrus Research International (CRI)

It has come to CRI's attention that there is a serious shortage of hydrochloric acid (HCl) in South Africa. This is critical to packhouses that use HCl acid to adjust pH both for the imazalil solution (bath and flooder) and the chlorine wash system.
The shortage is due to several factors, but primarily due to South African plant failures or shut downs which are likely to continue for at least several months. A small amount of HCl is currently manufactured by the timber industry in South Africa, with all excess being directed to the gold mining industry.

PERACETIC ACID (PAA)

For packhouses using **liquid** Peracetic acid (PAA) sanitisers in their imazalil (IMZ) baths, there is the added benefit of lowering the pH of the IMZ solution, and so alternative pH adjustments are not necessary. During this HCl shortage period, it might be prudent to use PAA in combination with IMZ. Using the recommended dosage of PAA as a sanitiser will result in variable pH levels dependent on water quality and starting pH, but will generally be within the correct range for most effective IMZ use. Please consult your supplier if using PAA in the fungicide bath for the first time. Heating and incorrect dosages may lead to phytotoxicity and worker discomfort. Peracetic acids also need to be topped up regularly to maintain the concentration and subsequent biocidal activity. The following options are available:

- Citrocide available from Citrosol
- Hypercide available from ICA

Please note that Deccocide powder formulation, available from Citrashine, **does not lower** the pH. **For the chlorine bath, PAA may not be used for pH adjustment.** PAA and chlorine are incompatible. As a general rule, sanitisers should **never** be combined.

ALTERNATIVE ACIDS

Alternative acids to HCl are available, with sodium bisulphate being the best option. It has the molecular formula $NaHSO_4$, and is known as dry acid. Other acids may also be used, but there are several critical warnings:

- Many organic acids are not only expensive, but also broken down by chlorine, which subsequently **inactivates the biocidal efficacy of chlorine***. The simpler the organic acid, the better. This is because the longer the hydrocarbon chains of the acid, the more readily chlorine will oxidise (i.e. breakdown) the acid.
- Inorganic acids such as hydrochloric acid may be very **harmful to humans and extreme care should always be taken** when handling these dangerous acids.
- **Acetic acid (CH_3COOH):** This is a very simple acid and although an ingredient in PAA, will not interact negatively with chlorine. As is the case with HCl, it may be reactive towards concrete with a high lime content and should be used judiciously**.
- **Phosphonic acid** can be used, but it will contribute to the residues of fosetyl and phophonic acid left by preharvest application of phosphonates, and may result in MRL exceedances.
- **Nitric acid (HNO_3):** This is the second **recommended replacement for HCl** and is compatible with chlorine. However, it is aggressively reactive with the calcium and CH bonds in concrete and will destroy any area it comes in contact with*** (it is this quality that makes it useful for the removal of scale in hydroponic systems). It should be stored in a suitable drip tray. **If your chlorine wash is a built-in concrete tank, avoid nitric acid.**
- **Citric and lactic acids:** These are typical organic acids that will be oxidised by the chlorine and **should not be used.** In addition, very large quantities will be needed to adjust the pH of an average aqueous application volume**.**

*: Kuroiwa, K., Nakayama, H., Kuwahara, T., Tamagawa, K., Hattori, K., Murakami, K., Korai, H. and Ohnishi, Y. 2003. Augmenting effect of acetic acid for acidification on bactericidal activity of hypochlorite solution. Letters in Applied Microbiology 36: 46–49.

**: Shia, C., & Stegemann, J.A. 2000. Acid corrosion resistance of different cementing materials. Cement and Concrete Research 30: 803 - 808.

***: Pavlik, V. 1994. Corrosion of hardened cement paste by acetic and nitric acids. Part 1: Calculation of corrosion depth. Cement and Concrete Research 24 (3): 551-562.

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Verseker die toekoms van sitrus deur wetenskap
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Soutsuur (HCl) tekort in Suid Afrika

Wilma du Plooy en Catherine Savage,
Citrus Research International (CRI)

Dit het onder die CRI se aandag gekom dat daar in Suid Afrika 'n ernstige tekort aan soutsuur (HCl) is. Hierdie is krities vir pakhuise wat HCl gebruik om die pH van chloor toedieningsisteme en die imasaliel (IMZ) fungisiedebad aan te pas.
Die tekort is weens verskeie redes, maar hoofsaaklik as gevolg van die faling, asook die onderhoudsluiting van vervaardigingsaanlegte. Die hout- en pulpindustrie vervaardig hul eie HCL en enige oorskot gaan tans na die goudmyne.

PERASYNSUUR (PAA)

Vir pakhuise wat die vloeibare perasynsuur (PAA) saniteerders in hulle imazalielbaddens gebruik, is daar die meegaande voordeel dat dit die pH van die oplossing afbring. Addisionele pH aanpassings mag dus onnodig wees in hierdie geval en die gebruik van PAA saam met IMZ is verstandig. Teen die aanbevole dosis van PAA is die pH van die watertoediening dikwels variërend en afhanklik van die inkomende waterkwaliteit en aanvangs pH. Dit is egter meestal in die korrekte omgewing vir effektiewe IMZ werking. Konsulteer asseblief met die PAA verskaffer wanneer die produk vir die eerste keer in die fungisiedebad gebruik word. Warm water en verkeerde dosisse mag lei tot fitotoksiese newe effekte en werkersongemak. Perasynsuur moet ook gereeld aangevul word om die konsentrasie en gevolglike effektiewe biosidiese aktiwiteit te behou. Die volgende opsies is beskikbaar:

- Citrocide beskikbaarvanaf Citrosol
- Hypercide beskikbaar vanaf ICA

Let asseblief daarop dat Deccocide poeierformulasie wat beskikbaar is vanaf Citrashine, **belis nie** die pH verlaag nie.
Perasynsuur mag nie gebruik word om pH verstellings aan te bring in die chloorbad nie, want PAA en chloor is onverenigbaar. Die algemene reël is in elk geval dat saniteermiddels **nooit** gekombineer mag word nie.

ALTERNATIEWE SURE

Daar is alternatiewe sure vir HCl beskikbaar. **Die veiligste opsie is natriumbisulfiet** (molekulêre formule $NaHSO_4$), ook bekend as droë suur. Toediening moet met die verskaffers bespreek word. Ander sure kan gebruik word, maar daar is 'n paar baie ernstige waarskuwings waarop gelet moet word:

- Meeste organiese sure nie net baie duur nie, maar word dit afgebreek deur chloor. Hoe eenvoudiger die organiese suur is, hoe beter. Die langer koolstofkettings van die meer komplekse sure word deur chloor geoksideer (dws afgebreek), **sodat die biosidiese effektiwiteit van chloor geïnaktiveer word***.
- Anorganiese sure, soos soutsuur, is meestal **gevaarlik vir mense en moet uiterste versigtigheid altyd** aan die dag gelê word met die gebruik daarvan.
- **Fosforig suur** kan gebruik word, maar sal bydra tot die residue van fosetiel en fosforigsuur wat deur die vooroes aanwending van fosfonate gelaat word en mag dus lei tot oorskryding van die MRL.
- **Asynsuur (CH_3COOH):** Hierdie eenvoudige organiese suur is weliswaar 'n bestanddeel van PAA, maar sal nie negatief met chloor reageer nie. Soos met HCl, moet dit egter met oorleg in sementbaddens gebruik word, veral beton met hoë kalk inhoud**.
- **Salpetersuur (HNO_3):** Hierdie is die **tweede aanbevole plaasvervanger vir HCl** en is verenigbaar met chloor. Dit is egter aggressief teenoor die kalsium en CH bindings in beton en sal enige area waarmee dit in aanraking kom, verbrokkel*** (dis egter om hierdie rede nuttig in hidroponiese stelsels). Gevolglik moet met HNO_3 in 'n drupbak gewerk word en moet dit ook daarin gestoor word. **Indien die chloorbad 'n betonbad is, moet dit nie gebruik word nie.**
- **Sitroen- en melksuur:** Alhoewel hierdie organiese sure is, is dit tipiese verbindings wat geredelik deur chloor **geoksideer word en dus vermy moet** word. Daar sal ook besonder baie daarvan nodig wees om die gemiddelde waterbad se pH te kan verstel.

*: Kuroiwa, K., Nakayama, H., Kuwahara, T., Tamagawa, K., Hattori, K., Murakami, K., Korai, H. and Ohnishi, Y. 2003. Augmenting

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