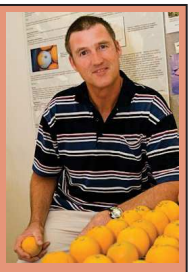
Packer Newsletter

Volume 105 October 2012

Editor: Peter Taverner
Waite Research Precinct
GPO Box 397
Adelaide 5001
Phone 08-83039538
Web Address:
http://www.sardi.sa.gov.au/foodinnovation/publications/citrus_packer_newsletter



send me an e-mail :
peter.taverner@sa.gov.au

HAL
Horticulture Australia

Fungicide and Sanitisers - new products, new compatibility issues.

[*In this article, Nancy discusses fungicides and their compatibility with various sanitisers. No! I haven't asked Nancy to write an article while on maternity leave; it's a reprint from 2009.*

There are a few areas in the article that required changes. Most notably, the original article include carbendazim, which is no longer used. I have removed any reference to this active from this version.

Just a general comment before you read the article: Compatibility is an going issue because of new products and mixtures of products. This article does not include two new recently registered fungicide actives , fludioxonil and pyrimethanil. There is also no evaluation of the compatibility of sanitisers with carbonate salts. As you are aware, we are advocating the use of fungicide and carbonate salt mixtures to help control sour rot and to combat fungicide resistance to mould. Three-way mixtures creates a new dimension to compatibility testing. We are trying to work our way through these combinations now—I think that the next compatibility guide will need to be a booklet rather than a chart.

Sorry to digress; please begin reading the article — Ed]

The last time we published something about fungicide/sanitiser compatibility was in Packer Newsletter 81 back in 2006 and in the previous edition to that in 2005 I discussed why packers still needed to be concerned about compatibility. Its now 2009 and sanitiser/fungicide compatibility is still an issue! Why is it an ongoing issue you might ask – haven't we covered this numerous times before? Well yes and no! There are a number of reasons why we need continued revision:

We still have no fungicide that can be used on our export fruit to control sour rot; sanitiser use reduces the build up of spores in bulk dips and recirculating solutions and prevents the disease-producing spores washing on to otherwise healthy fruit.

The worldwide reduction in minimum residue limits (MRL's) for some fungicide actives means that we become more reliant on remaining fungicides, and that we also become more dependent on effective sanitisers; we need to be vigilant about what can and can't be mixed together.

New products are always coming on the market either with known actives but some with new actives that need reviewing in a compatibility context.

The industry is constantly hiring new employees and new industry representatives; technical information needs continual revision and all staff need to be kept up to date on changes.

This article aims to review what we know so far about compatibility and update you

(Continued on page 2)

Inside This Issue

Read the Packer Newsletter and stop the rot.

SARDI
South Australian Research and Development Institute

Government of South Australia
Primary Industries and Regions SA

MEASURING PERACETIC ACID—OR SHOULD THAT BE HYDROGEN PEROXIDE

I was recently asked "What should I be testing ? Hydrogen peroxide or peracetic acid (PAA)'. It is a fair question because PAA products are a mixture of hydrogen peroxide, PAA and acetic acid. PAA is a stronger sanitiser but both have activity. Packers are likely to use test strips. So, I tried to find out what they actually measure.

Test strips for hydrogen peroxide usually test for presence of the peroxide functional group. PAA also has this same peroxide functional group. The test strip can't distinguish between peroxide or PAA. So, measuring hydrogen peroxide in a hydrogen peroxide / PAA mixture will overestimate the peroxide. For a product like Tsunami, where the ratio of PAA to hydrogen peroxide is about 1:1, this can be significant.

Just to complicate things, PAA has half the number of peroxide groups as hydrogen peroxide. So, you just can't halve the reading and hope for the best. PAA and hydrogen peroxide also have a different rate of decomposition. So, the proportions will change with time and topping up.

Ok; what about testing for PAA? Peracetic acid can be determined with a different test strip that relies on the ability of PAA to oxidize iodide to iodine The iodine then reacts with starch to form a grey-purple colour. In a hydrogen peroxide / PAA mix it is still possible to use this test because the PAA tends to react more readily with the iodide. You do need to read within a short time before the hydrogen peroxide can interference with the result. But, I have found that it can be hard to distinguish different shades of grey quickly enough. What to do? Ideally, test for both. Sorry; I'm not much help.

Peter Taverner

(Continued from page 1)

with new information and research in sanitiser/fungicide compatibility that is currently been done here in the SARDI labs.

LABORATORY STUDIES

In the last ten years SARDI has produced 2 compatibility charts. The aim of the charts was to look at the evolution of sanitiser over a 24hr period – with the measurement representing whether the mix was compatible. Rapid loss of sanitiser concentration over this time meant that the chemicals should not be mixed together, a slow or nil loss in concentration means that the sanitiser/ fungicide combination could be utilised if needed. The first chart, completed in 1999, reviewed 6 sanitisers (6 active ingredients) with 8 different fungicide products (3 active ingredients). A second chart was produced in 2005 with 4 sanitisers (4 active ingredients) and 11 fungicide products (4 active ingredients). Although there have been several new actives and formulations of sanitisers released, there are 3 fungicide active ingredients regularly used by packers on citrus postharvest, they are fungicides which contain imazalil, thiabendazole and guazatine. Carbendazim can not longer be used .

Most sanitisers when mixed with these 3 fungicide actives will lose concentration over 24 hours and packers must take note of this if they are to mix sanitisers and fungicides together. However, there is some short term stability for many of the combinations that can be suitable as long as the combinations are monitored. Table 1 is a condensed summary of compatibility (approximated with currently commercially available sanitisers and fungicide actives) – although it does not show individual products or specify formulation **(please consult the available charts on specific products)** the table shows the outcome that is generally expected with these particular fungicide/ sanitiser combinations.

Nancy Cunningham

TABLE 1—FUNGICIDE ACTIVE AND SANITISER COMPATIBILITY

Fungicide Constituent	Compatibility after 4 hours			
	Calcium hypochlorite	Chlorine Dioxide	Peroxyacetic acid	Bromo Chloro dimethyl hydantoin
Imazalil	xx	✓	✓✓	xx
Guazatine	xx	✓	✓✓	✓
Thiabendazole	✓✓	✓✓	✓✓	✓✓

Key:		
	✓✓	Loses no concentration after 4 hours
	✓	Loses some concentration after 4 hours
	xx	Loses concentration rapidly over 4 hours

CHLORINE AGGREVATES CHILLING INJURY

Reprint from Packer Newsletter no. 60

During the 1999 Washington navel export season there was an unusually high incidence of chilling injury damage to the fruit exported to Japan. This was mainly attributed to the longer period of storage in Australia that was required for cold disinfestation at 1° C. This temperature is below the recommended storage temperature and when fruit are held at it for long periods they run the risk of developing chilling injury (Figure 1, page 3).

The reasons for the higher than normal incidence of this disorder was put down to seasonal conditions, particularly the relatively warm winter temperatures. However in an attempt to further investigate the causes, an experiment was conducted on Valencia oranges looking at packinghouse treatments that had recently been introduced or changed.

The treatments were:

• Control – fruit washed with clean water as

(Continued on page 3)

(Continued from page 2)

they passed over revolving brushes,

• 200ppm chlorine as a 30 second dip prepared from calcium hypochlorite

• 20 ppm chlorine dioxide prepared from Castle Wash®

• TectoSC®, 1000 ppm dip

• Tecto90®, 1000 ppm dip

• Carnauba based citrus wax

• Shellac based citrus wax

All fruit were first washed on revolving brushes and then dipped in the treatments being tested. They were then stored at 1°C for 4 weeks followed by 2 weeks at 5°C. This approximated the storage/ temperature regime experienced by fruit sent to Japan. At the completion of this storage period fruit were examined for cold storage pitting and placed in categories depending on the degree of rind damage; 0, nil rind damage; 1, trace; 2, slight; 3, moderate and 4, severe. The number of fruit in each class was multiplied by its value and the products summed and then divided by the number of fruit assessed. This resulted in a chilling injury index, values obtained were statistically analysed by Analysis of Variance with 3 replications. Means were compared using a Least Significant Difference value at the 5 % level of significance.

Results

The results in Figure 2 show a significantly marked increase in chilling injury damage when fruit were treated in a chlorine dip at 200 ppm. Chlorine Dioxide treatment at 20 ppm also significantly increased the level of chilling injury, but this was a concentration, approximately 4 times that normally used.

The other treatment tested was the new formulation of thiabendazole, TectoSC. Previous research has shown that this thiabendazole reduced the incidence of chilling injury when applied as the Tecto 90 formulation. This was confirmed in this experiment, but when it was applied as TectoSC it failed to give a significant response. However both the wax treatments applied reduced chilling injury. This also confirms previous findings.

The results overall help explain why the incidence of chilling injury is increasing in our export consignments particularly where they involve storing for extended periods in a temperature range known to cause chilling injury. The increased use of chlorine in recent years has been as a result of measures taken to prevent the spread of fungal spores, which cause sour rot, *Geotrichum candidum*. The results however place industry in a difficult situation. If they continue to use chlorine dips and sprays they increase the risk of chilling injury, if they don't use it the risk of sour rot increases. Sanitisers besides chlorine, such as chlorine dioxide at lower concentrations and Nylate could be a solution to the problem but further work is needed to determine they have any effect on chilling injury incidence. The combination role of citrus waxes with the chlorine treatment also needs to be investigated to see if the wax effect in reducing chilling injury is sufficiently strong enough to balance the effect of chlorine.

Brian Wild

[This 'ancient' work by Brian Wild (retired) may have renewed significance with the large amount of fruit requiring cold disinfestation for fruit fly. The importance of sanitiser rates, fruit coatings and TBZ loading may all require further investigation to provide ways to reduce the risk of chilling injury—Ed]

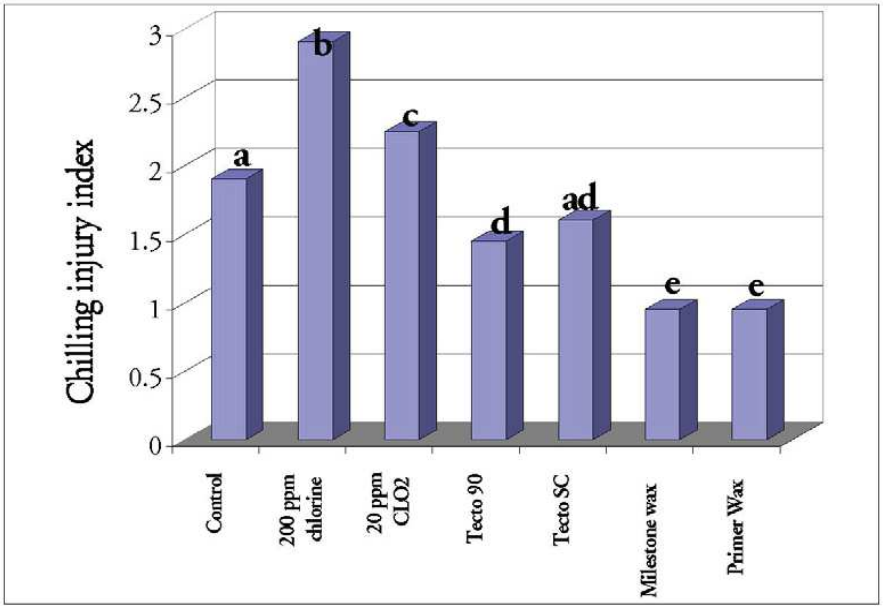


FIGURE 2: CHILLING INJURY IN VALENCIA ORANGES TREATED WITH DIFFERENT POSTHARVEST DIPS AND HELD FOR 4 WEEKS AT 1°C FOLLOWED BY 2 WEEKS AT 5°C. COLUMNS COVERED BY THE SAME LETTER DO NOT DIFFER SIGNIFICANTLY ($P<0.05$).

Acknowledgements

The National Citrus Postharvest Science Program, based at SARDI, has been facilitated by HAL in partnership with Citrus Australia for the period of June 2011–Mar 2015. It has been funded by citrus grower levies and major voluntary contributions from regional citrus marketing boards. The Australian Government provides matched funding for all HAL's R&D activities. Several citrus packers and service providers have also contributed funds for specific activities.

Major voluntary contributors:

POSTHARVEST SNIPPETS!

SOUTH AUSTRALIAN CITRUS INDUSTRY DEVELOPMENT BOARD

I would like to acknowledge the 'posthumous' financial contribution by the South Australian citrus board. I have removed their logo because they cease to exist but they honoured their pledge to support the project for the 2012/13 financial year. Typical of the Board's unwavering support to our program. The citrus Board has always supported our work. This was very important to us in the early years when we had a low profile and our work was not really seen as 'value to growers'.

On a personal note, I will greatly miss Andrew Green, the last Executive Officer of the Board. Andrew was a tireless worker and an extraordinarily effective advocate for the citrus industry. I wish him well in his new endeavours.

CITRUS AUSTRALIA NATIONAL CONFERENCE

Next week, most of you will be off to Leeton for the National conference. Unfortunately, it clashes with our resistance monitoring schedule: So, I won't be there.

I would like to acknowledge Nathan Hancock for organising the technical poster session. He coordinated all the researchers to ensure there is a good representation. He also gently reminded me to produce a poster for the conference. So, I will be there in spirit.

FUNGICIDE FORMULATIONS AND COMPATIBILITY

Reprint from Packer Newsletter no. 94

Why formulations are important

Our experience in mixing sanitisers with fungicides has shown that certain formulations of fungicides seem to affect some sanitiser concentrations more than others. Many fungicide actives are not soluble in water and need to be mixed with a surfactant or stabiliser in order to assist with application and effectiveness. These ingredients are generally inert but differ from product to product – many of these ingredients are unknown and are often not revealed by the manufacturers. The kinds of formulation you might expect with fungicides are as follows:

Emulsifiable Concentrate (EC) where the a.i. is dissolved in a strong solvent and an emulsifier in order that it can be mixed with water.

Suspension Concentrate (SC) where the ingredients of the a.i. are finely ground and mixed with emulsifiers and stabilisers. SC formulations will often settle out of suspension over time. There is also a "flowable" form.

Wettable Powder/granules/soluble powder (WP, WG, WSP) the a.i in these formulations is finely ground and dispersants and wetters added, in some instances silica gel is also added. They can then be diluted with water giving a stable dispersion or solution of the active compound.

Liquid (L/LS) these formulations generally are compounds where the a.i is water soluble.

Different formulations of the same active can sometimes differ in stability, for example WP or WSG have sometimes been shown to be more stable with some sanitisers than their EC counterparts despite having the same active ingredient!

Some points to remember for compatibility:

- Adhere to the instructions on the label
- Explore other possibilities before mixing chemicals
- If there is no option but to mix then check for visual changes in solution when mixed, slight changes could warn of incompatibility issues.
- Check for fungicides settling out of solution –especially active ingredients in suspension concentrate products.

Monitor any rapid decrease in sanitiser concentration. Failing to do this could mean that you are running your line without any sanitation and you could affect the fungicide in use as well.

Nancy Cunningham