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Packout percentage and profitability

Peter Taverner

SARDI

I try to avoid technical jargon where possible, but there is one phase that just keeps coming up; 'value chain'. There is a citrus value chain project proposed for South Australia and Citrus Australia has appointed value chain coordinators. I am part of the Food Innovation and Value Chains group, within SARDI, but I'm embarrassed to say that I only have a 'fuzzy' idea of what value chain means. In doubt, I went to Wikipedia for a definition:

'A value chain is a chain of activities for a firm operating in a specific industry. Products pass through all activities of the chain in order, and at each activity the product gains some value. The chain of activities gives the products more added value than the sum of added values of all activities.'

It seems that value chain is a concept from business management that has been expanded to include supply chains and distribution networks.

Is there value to citrus in the term 'value chains'? Sometimes, buzzwords pander to professional vanity, and can obscure that very little of value is being said. At other times, they focus attention on areas of neglect and create the impetus to re-think our approaches. Let you be the judge.

I would like to put forward my skewed opinion of a citrus example of value chain analysis. It clearly pre-dates the term and involves analysis of packout percentages and profitability conducted by Dr. Bill Grierson and others.

As a tragic postharvest researcher, my bedtime reading of Fresh Citrus Fruits (2006) probably seems a bit, well, tragic. However, I was intrigued to read an article by Grierson and Wardowski about packout and profitability, with references to various economic studies dating back to 1957. It suggested this analysis was something they felt was irrationally ignored. As they said, 'The obvious, unfortunately, constantly needs to be restated.' In their case, restated in articles in the 1950, 60's, 70's, and again in two editions of the Green Bible (as Fresh Citrus Fruits is affectionately known).

Grierson (1957) considered all the costs of growing to FOB sale of fresh citrus in Florida. He was interested

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in determining typical packouts, the effect of packout on final profit or loss, and when it would be more profitable to send the whole crop for processing. He even produced a formula for packers to work out the percentage packout to break even.

Grierson was interested in reporting on grade-lowering factors, such as excessive green colour, and how they affected profits. Fruit colouring is much less a problem in most of Australia, but it would be interesting to look at how some other factors alter profits. I would be interested in looking at grade-raising factors, such as high pressure washes, and their effect on packout and profitability.

It seems self-evident that profit varies directly with packout, with the relationship of profit to packout changing as the difference between fresh and juice prices alter. Grierson felt that this relationship was commonly ignored due to;

1. lack of coordination between managers responsible for growing and packing,
2. emphasis on reducing costs of individual operations rather than concentrating maximizing overall net returns, and
3. archaic accounting systems.

In regard to feedback to growers, statements may be correct, but still misleading. Grierson gave a good example in the following packer statement:

Price at processor	$1.00 per box
Transport cost	-0.07 per box
Return to grower	$0.93 per box

This statement gives a false impression that the grower is making money while the processor is getting very cheap fruit. A more detailed accounting revealed:

Cost of growing	$1.40 per box
Cost of harvest and haul	$1.33 per box
Cost of packingshed handling	$0.45 per box
Transport cost to processor	$0.07 per box
Total costs	-3.25
Price at processor	+ 1.00
Net loss	- $2.25

This accounting example is blatant. His studies showed also some interesting and, perhaps, counter intuitive relationships between price and packout. Fresh fruit prices can vary from year to year and there is a tendency to reduce costs when low prices are expected. However, this may be counter productive if it reduces overall packout percentages. His studies indicated that in a low-price year increasing packout from 60% to 70%, increased the profits per box from 8.8c to 19.6c or 10.8c (123% increase in profits). Interestingly, in a higher-price year the profit increase from 60% to 70% packout was 15.7c, which was only an increase of 28%.

Obviously, these figures are outdated being 40-50 years old, but the principles are still relevant. The 3 points that Dr. Bill Grierson felt were commonly ignored in 1959 are still hauntingly familiar. Anecdotally, a lot of growers are unclear about the relationships between packout and profits from their statements. Marketing managers and grower liason officers may still make decisions in isolation from each other. However, I also feel that packers have made practical investments, such as high pressure washes, that have improved grower profits, but there has been no analysis of the changes to their bottom line.

The above approach seems to match with the 'new' emphasis on value chain analysis. The thing I like about these studies is they are conducted by someone with a strong industry and technical background, with the results firmly fixed within a practical context.

If similar work was conducted on Australian citrus; I would say, "Viva le value chain analysis".

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Using chlorine-based sanitisers in packigsheds.

Nancy Cunningham
SARDI

Over the last decade the use of sanitisers in Australian citrus packingsheds has increased significantly. Many who work in citrus packingsheds know that sanitation plays a key role in reducing the spread of decay. Using sanitisers to clean equipment or to sanitise wash water or fungicide tanks reduces the risk of contaminating healthy fruit with spores of sour rot (*Geotrichum citri-aurantii*) or blue and green mould (*Penicillium italicum* and *P. digitatum*). Sanitation can also reduce bacteria levels including human pathogens *Salmonella* and *E.coli.* Many packers often contact us to ask, "what is the best sanitiser for my shed?" The answer to this is not as simple as rattling off a particular sanitiser product – each shed is different and there are many things to consider before choosing one that is best suited to any particular shed. The wide choice of sanitisers on the market can also make the decision difficult. Essentially all sanitisers generally do the same thing or have the same 'mode of action'. That is to disrupt the membrane of the fungal cell wall. Depending on the circumstances some sanitisers can be more effective than others in certain situations (for example high organic loads). In this article I am going to focus on the main sanitiser that packingsheds are familiar with – hypochlorite's and will discuss some of the issues that packers may face when using this particular sanitiser.

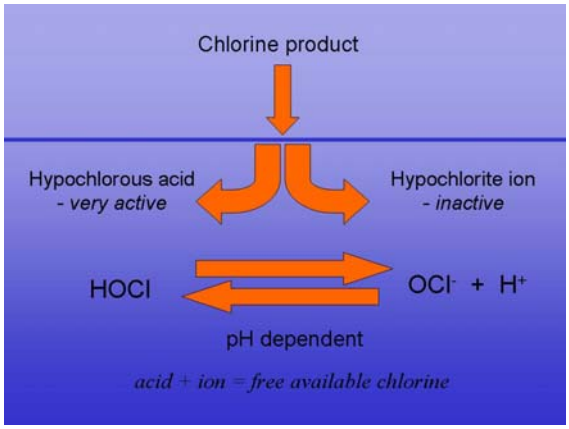

Figure 1 (above) shows how hypochlorite (as chlorine product) dissociates in water – the relationship is dependent on the pH of the solution

Chlorine

Chlorine based sanitisers are the most widely used sanitisers in the world. In citrus packingsheds the most common form of chlorine used is sodium hypochlorite (common 'bleach') or calcium hypochlorite (pool chlorine). The chlorine dissociates in water to form hypochlorous acid – the main antimicrobial ingredient. The amount of hypochlorous acid in any mixture will be dependent on the pH of the solution. Figure 1 illustrates this point.

The hypochlorous acid (activity) is highest in the acid pH range, but it gases off quickly. The reverse is true in the alkaline range, where hypochlorous acid (activity) is lower, but more stable. The best compromise is considered to be a pH of 7 (see table 1).

Advantages

Hypochlorites are cheap, readily available and easy to mix and use. Some forms of hypochlorite are available for use in automatic dosing machines – however many do not incorporate automatic buffering devices.

Disadvantages

When mixed, hypochlorites tend to be in the alkaline range (pH 8-10) with little or no active hypochlorous acid, so buffering is required to bring down to a more neutral pH. High concentrations of hypochlorites (above recommended) can cause corrosion to packingshed equipment. Organic matter (large

pH	% Hypochlorous acid	
3	99.7	Very high activity, Very unstable
6	97	Very high activity, Very unstable
7	75	High activity, stable (ideal)
8	28	Low activity, stable
9	3	Very low activity, stable

Table 1 (above) shows the percentage of hypochlorous acid (activity) at different pH. The most stable with high activity is around pH 7.

What does your chlorine test strip measure?

Peter Taverner
SARDI

If you have just read Nancy's article on chlorine-based sanitisers, then I suggest that you read on.

When first looking at chlorine tests, I assumed that the parts per million (ppm) reading in tests were giving me a direct reading of activity; but I wasn't sure. So, I spent some time reading various articles on chlorine chemistry to find a clear, simple explanation on the relationship between the various 'chlorine' readings and their biocidal activity. I didn't really find it. However, I did get a basic understanding on the relationship between pH and activity.

When 'chlorine' is mixed with water it separates into two parts; the hypochlorous acid and the hypochlorite ion. The total of the acid and ion components is called the free available chlorine. This total is usually what the test strip reads. If you read Nancy's article you will realise that the level of acid alters with pH, and it is the acid that is biocidally active. However, the total remains the same; only the proportion of these two components varies with pH. This means test strip reads the same free chlorine (ppm) regardless of the proportion of acid. In other words, the test strip reading doesn't give you all the information; you need to find out the pH as well.

If we assume a solution reading of 100ppm; what can we say about its activity? From Table 1 in Nancy's article,

- at pH=7, 75% acid (75% of 100 = 75ppm)
- at pH=8, 28% acid (28% of 100 = 28ppm)
- at pH=9, 3% acid (3% of 100 = 3ppm)

The above calculation is simplistic, but you should get the point. All these solutions give the same reading (of 100ppm), but their activity is very different depending on the pH of the solution.

As you are aware, our water tends to be on the alkaline range before adding sanitisers. In addition, we advocate adding carbonate salts, which shift the solution further into the alkaline range. You can compensate by changing to sanitisers that are less sensitive to pH, but can also still use hypochlorites if you are careful with your pH range. However, you may need to increase your rates.

If you topped up a solution at 400ppm, you could theoretically maintain good activity somewhere between pH 8-8.5. The solution may only have 15% as acid, but this is 15% of 400ppm (~60ppm). There are even some advantages to using a more alkaline solution. The alkalinity reduces the risk of corrosion, despite the higher overall chlorine concentration.

The main message is that you need to know both the concentration and pH to determine the biocidal activity of your hypochlorite solution. If you understand this you may be able to manipulate either the pH or the concentration to achieve the level of biocidal activity you require.

William Bliss

Earlier this year, I was saddened after receiving an email regarding the sudden departing of William Bliss. Part of the email text is below:

"*It is with sadness I inform you of Williams passing on 13th April 2010. He will be greatly missed and we as a family are very proud of his achievements. His approach to Post Harvest treatment with the Nylate is one of many examples.*"

Geoff Bliss (son)

Geoff asked me to include the above in the newsletter. I was please to do so, and think there are many people in citrus packing/processing that will reflect fondly on their experiences with his father.

I remember meeting William very early in my postharvest career and feeling overwhelmed afterward. Having a conversation with William was like wrestling an eel; you had to keep your wits about you at all times to grasp the ever-changing flow of topics. Don't get me wrong; there was a logical connection between topics. It was just that not all of us had the chemical background to instantly see the links.

Over the years, I developed a strong respect for William. He was a very enthusiastic man, with a sharp and enquiring mind. He was a lateral thinker, with a wealth of knowledge and a solid practical edge.

He was a prominent figure in sanitation and a pioneer in many areas. The development of the Nylate system is an excellent example of his innovative approach. He will be missed by many, but, his legacy continues with the family business.

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Acknowledgements

We acknowledge the support of Horticulture Australia and Citrus Australia (in its role as the Citrus Advisory Committee) for supporting our postharvest citrus research. We also wish to thank the three regional citrus boards (SA Citrus Industry Development Board, Murray Valley Citrus Board and Riverina Citrus) and Riversun Export for their financial support of our activities, including this newsletter.

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Changes to Office Hours

We have tried to keep an on-demand service for the industry, but further reductions in resources mean some reduction in services is necessary. Please be patient as someone will deal with your enquiry as soon as possible (this is not a recording).

From the 1st July, Nancy (Cunningham) will be available for general postharvest enquiries Monday, Tuesday and Wednesday. I will be nominally available 1 day per week for general postharvest work. Unfortunately for me, most of my time will involve administrative tasks, with some short respite in writing the Packer Newsletter.

We are particularly grateful to the South Australian Citrus Industry Development Board and the Murray Valley Citrus Board for supporting the last 6 months of our postharvest program.

We will negotiate with Citrus Australia and other potential funding partners on maintaining good postharvest services beyond 2010.

In the interum, we will concentrate our activities in the Riverland and Mildura areas.

Nancy has separate resources for specific postharvest oil work through a Citrus Australia approved project administered by Horticulture Australia. She will provide advice on oil use and conduct sheds visits when required. We would like to acknowledge Caltex Australia for their support of this work.

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