

A STEP-BY-STEP TESTING MANUAL TO PROMOTE

# Australian Citrus Quality Standards



*A simple and effective  
5 **step guide** to assist  
Growers, Packers,  
Retailers & Marketers  
in the quality testing process.*

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**Citrus**   
Australia

**A**t Citrus Australia, we recognise quality is important and that is why we have developed a simple set of standards outlined in the following Manual.

Called the Australian Citrus Quality Standards, they aim to assist growers, packers, marketers and retailers consistently deliver quality citrus that Australian consumers can enjoy with confidence.

There are three key factors that encourage consumers back to purchase more citrus fruit:

- > the level of juiciness
- > the level of sweetness
- > a good balance between sweetness and acid.

Following an analysis of consumer research, commercial standards and industry consultation and discussion, minimum standards for these three factors were unanimously agreed upon by the whole of industry.

The internal maturity of citrus differs between citrus types and varieties so there are different standards for each citrus type and where necessary variety. The Australian Citrus Quality Standards refer to the percentage of juice in a fruit, the amount of sugars (measured in degrees Brix) and the sugar to acid ratio.

At the end of the day, developing these standards has been about maintaining and expanding market share and reinvigorating consumer confidence in our fruit. By putting the consumer first we hope to create loyal and repeat customers of Australian citrus in every retail outlet in the country.

We all acknowledge that, in recent years, the competition for the consumers' dollar has intensified – by adopting these standards and delivering consistently good tasting fruit to the consumer we think we'll see more dollars in growers' pockets.

The Manual's easy to read instructions are backed up by support from the Citrus Australia office. We aim to assist you in keeping your valuable consumers happy and coming back for more.



Judith Damiani  
CEO, Citrus Australia

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# Citrus Maturity Test Record Sheet

PHOTOCOPY MASTER

NB: a COPY of this record sheet should be used EACH TIME a new citrus maturity test is conducted. (A *printable version of this sheet can also be found at [www.citrusaustralia.com.au](http://www.citrusaustralia.com.au)*)

Date:		QC:
Sample ID:		
Fruit weight	g	
Juice weight	g	
NaOH	mL	
Acid	%	
	Pass/Fail	
Juice %		
Brix°		
Brix°:acid ratio		
Comments:	.....	
	.....	
	.....	
	.....	

## Equipment required

1. Good quality scales with 1g graduations, at least 3kg maximum
2. 1 to 2 litre jug or beaker
3. Fine sieve with 1-2mm mesh range
4. 0.1% sodium hydroxide (NaOH)
5. 1% phenolphthalein indicator
6. Fruit juicer (manual or electric ream only – no centrifugal, masticating or twin gear juicers)
7. 100mL conical flask or 100mL beaker
8. Refractometer (digital or hand-held – must be temperature compensated, with a 0 – 32%)
9. 50mL burette (auto-fill burette pictured on page 10)
10. 10mL pipette and pump
11. Kitchen knife
12. 1 litre volumetric flask (*not pictured*)
13. Distilled water and squeeze bottle (*not pictured*)
14. Tissues (*not pictured*)



## Citrus Quality Testing Instructions

You can decide if a batch of citrus is acceptable for eating by following these **five easy steps**:

- Step 1:** Collect the sample which is to be tested from each orchard block or market consignment.
- Step 2:** Measure the juice content of the fruit.
- Step 3:** Measure the sugar level (also known as the Brix<sup>o</sup>) of the juice.
- Step 4:** Measure the acid level of the juice.
- Step 5:** Calculate the sugar-acid ratio by dividing the Brix<sup>o</sup> by the acid.
- Finally:** Compare your test results with the Industry Standards. If any one of the Standards is not met, the fruit are not suitable for picking or marketing.

The following pages explain in detail each of the five steps.

## Step 1 > Collect a sample

You will need at least 10 pieces of fruit, however, the more fruit you test the greater the accuracy of your result. For smaller fruit such as mandarins, 20 pieces of fruit is preferable.

### Orchard samples

Your sample must be typical of what you are planning to pick.

For example, if you plan to **select pick**, then collect fruit of the same size and/or colour that you will be picking.

If you plan to **strip pick**, then collect an even mix of fruit of all the sizes and colours on the tree – be sure not to only pick the fruit that is most coloured!

In both cases, you must collect fruit from all sides of the trees as well as inside the canopy.

You must also collect fruit from at least 10 trees spread throughout the block.

**Make sure all the fruit are sound, with no rots or rind punctures.**

You will need separate samples from each block or patch if the variety, rootstock, tree age or soil type is different – because all these things will affect the taste of the fruit.



### Pack-house, Market and Distribution Centre samples

The sample must be typical of a whole consignment – do not collect all the fruit from just one carton.

When **checking a pallet**, take no more than two pieces of fruit from each carton – therefore you will need to collect fruit from at least five cartons. Preferably collect one fruit from each of 10 cartons.

If you are **checking a consignment of many pallets**, make sure you take fruit from each pallet, and from as many cartons as possible.

**The golden rule is: spread it out as much as possible.**

Make sure all the fruit you select are sound, with no rot or rind punctures.

## Step 2 > Measure the juice content

1. Place a clean tray on the scales and push the Tare or Zero button.
2. Place your fruit sample on the tray and record the weight, to the nearest gram (g).
3. Juice all the fruit using the ream juicer, push down evenly to remove all the juice.
4. Place a clean, dry jug or beaker on the scale and push the Tare or Zero button.
5. Pour the juice through a 1-2mm mesh sieve into the jug/beaker.
6. Record the juice weight, to the nearest g.
7. Divide the juice weight by the fruit weight and multiply this by 100 to get the juice percentage.

### *Example calculation:*

Fruit weight = 600g

Juice weight = 288g

Juice weight  $\div$  Fruit weight  $\times$  100 = percentage (%) juice

288 grams  $\div$  600g  $\times$  100 = 48% juice

*Weigh sample and record results. Tare or zero the scales when using a tray.*



*Sieve juice through a fine (1-2mm mesh) sieve before weighing.*





## Step 3 > Measure the Brix°

Use a refractometer to measure Brix°. There are two types:

- > Hand-held refractometers, which have a prism with a lid for holding the juice sample.
- > Digital refractometers, which have a well for holding the juice sample.

### Calibrating your refractometer

Always calibrate your refractometer at the start of the day, and then again after every 10 readings. To calibrate the refractometer:

1. Wipe the prism or well with distilled water and dry with a clean tissue.
2. Add a couple of drops of distilled or deionised water onto the prism/well.
3. Zero the refractometer and then wipe the prism/well dry with a tissue.
4. You are now ready to test your juice samples.

### Using a hand-held refractometer

1. First clean and dry the prism using distilled water and a clean tissue.
2. Place a couple of drops of the fresh juice onto the prism/well.
3. Look through the eyepiece while aiming the prism towards good light (not the sun).
4. Focus the eyepiece and take the reading where the base of the blue colour sits on the scale.
5. Record the Brix° figure and then clean the prism with distilled water and a clean tissue.



*Direct the refractometer to a good light source.*

### Using a digital refractometer

1. First clean and dry the well using distilled water and a clean tissue.
2. Place a couple of drops of the fresh juice onto the well.
3. Press the Start button and record the Brix° reading.
4. Clean the well with distilled water and a clean tissue.



*Digital refractometer.*

## Step 4 > Measure the acid content

### **CAUTION - Chemical handling**

**0.1% sodium hydroxide (NaOH) is a caustic substance and should be handled with care.**

**PVC gloves and safety glasses should be worn when handling 0.1% sodium hydroxide.**

**Keep containers tightly closed and store in a cool, well-ventilated area away from incompatible chemicals such as strong acids.**

1. As a safety precaution please wear safety glasses and gloves for this step.
2. Suck 10mL of juice into the pipette and release the juice into a clean conical flask.
3. Rinse the pipette immediately after releasing the juice.
4. Add three to four drops of phenolphthalein indicator to the conical flask and carefully swirl the mixture.
5. Squeeze the burette fill bottle, containing 0.1% sodium hydroxide (NaOH), to fill the burette.
6. Open the burette tap and allow a trickle of NaOH to run into an empty beaker. This is to get rid of any air in the burette spout.
7. Squeeze the burette fill bottle again until the NaOH level in the burette reads zero at the top of the scale.
8. Hold the conical flask containing the juice mix under the burette and while swirling the flask slowly add the NaOH to the juice by opening the burette tap.
9. Keep swirling the flask while adding NaOH, until the mix just starts to turn pink.\*
10. As soon as the solution turns pink close the burette tap.
11. Look at the scale on the burette and record how much NaOH you have added to the flask.
12. Multiply the figure you have recorded by 0.064 to give you the acid level of your sample.



*Auto-fill burette – simply squeeze the bottle to fill the burette.*

*\*SEE NOTE AND EXAMPLE CALCULATION ON FOLLOWING PAGE >*

## Step 4 > Measure the acid content (continued)

\* *The first few times you do this procedure it may be difficult to see the colour-change point. The juice mix will slowly lighten in colour, almost becoming clear and then change to a light green colour before turning pink. This is the point just before the end of the test and a few extra drops of the sodium hydroxide (NaOH) will make the solution turn pink. The solution will change from a pink colour to a deep purple/orange if too much NaOH is added. If this happens empty the flask and start again.*

### *Example calculation:*

Amount of NaOH x 0.064  
 = acid percentage (%)  
 NaOH added = 24.2mL  
 24.2 x 0.064 = 1.55 % acid



*Adding the 0.1% sodium hydroxide to the juice and phenolphthalein solution. Note the swirl of pink in the sample.*

## Step 5 > Calculate the sugar:acid ratio

Calculate the sugar-acid ratio by dividing the Brix° recorded in Step 3 by the acid percentage recorded in Step 4.

This will give you the number of parts of sugar to every one part of acid, which is the sugar-acid ratio of the sample.

### *Example calculation:*

Sugar concentration = 15.2 Brix°  
 Acid percentage = 1.55 %  
 Brix° ÷ Acid percentage = sugar:acid ratio  
 15.2 ÷ 1.55 = 9.8 : 1 sugar:acid ratio

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