QUALITY MATTERS
NOT ALL WATER IS THE SAME

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*The information for this article has been sourced from the NSW Department of Primary Industries Factsheet **'Water quality for chemical spraying'** by Sandra McDougall and the Grains Research and Development Corporation 'Spray water quality fact sheet'.*

These are just a small number of the large library of resources that are available to all passionfruit growers – nationwide – through the **Hort360 program** *managed by Growcom. Come along to one of the IPM Regional Field Days (SEE PAGE 12) this year to find out more about how the Hort360 programme can benefit you and your farm or visit* **www.hort360.com.au** *and browse the* **RESOURCES** *section.*

WATER QUALITY IS IMPORTANT

The quality of water used to mix with agricultural chemicals can reduce the effectiveness of the chemical applications. Poor quality water can:

- Reduce activity of agricultural chemicals
- Block spray lines or nozzles, reducing chemical application uniformity
- Increase wear of nozzles also causing reduced chemical application uniformity
- Increase wear on spray rigs

Water quality is highly variable and is dependent on the source of the water (e.g. rainwater, farm dams, river, bore, town reservoir). Water quality can also vary throughout the year and after periods of high rainfall or drought.

It is vital to use the cleanest water possible when preparing agricultural chemicals for application. Where clean rain water is not available, you should use the following guidelines to minimise spray failure due to poor quality water.

Note that some agricultural chemicals are more sensitive than others to poor water quality; check the specific instructions on each label for more information.

Water quality can vary from season to season and needs to be monitored regularly. By ordinary observation, you may be able to see changes in some aspects of water quality including colour, odour, iron staining, turbidity and presence of algae at problem levels. Reduced flows through irrigation equipment may indicate clogging or a build-up of scale. However most of the chemical changes to water quality cannot be detected by eye or smell. Some can be tested using portable instruments, but others need laboratory analysis.

Regular monitoring allows you to take action before too much damage or loss of production occurs. The frequency of water testing required depends on the intended use of the water and the source of the water.

TEST WATER REGULARLY

If using bore water or water sourced from the ground, obtain a full laboratory test annually and not more than two years apart.

If extending the interval between tests to two years, use test strips to check water quality in between. If a significant change in pH or hardness is noticed on the test strips get the water retested by a laboratory.

To be useful, a water testing regime needs to identify these facts about your water:

- pH;
- total hardness;
- turbidity; and
- either total dissolved salts (TDS) or salinity (EC or electrical conductivity)

See Table 1 on PAGE 9.

HARDNESS

Water hardness is caused by high levels of calcium and/or magnesium and is common for bore water. Water hardness is defined in terms of calcium carbonate ($CaCO_3$, 'lime') and is expressed as the total amount of $CaCO_3$ in milligrams per litre of water.

Water with 200 mg/L $CaCO_3$ can cause problems for chemical spray water; the suggested upper limit of hardness for water used for chemical sprays is 300 mg/L.

Description of water	Hardness expressed as mg/L of $CaCO_3$
Soft	less than 50
Moderately soft	50–75
Slightly hard	75–150
Hard	150–300
Very hard	greater than 300

SALINITY

Salinity is the concentration of all soluble salts in water. The amount of mineral salts dissolved in water is measured by its electrical conductivity (EC). The type of local rock and soil can influence the saltiness of water, but high EC is usually caused by runoff containing fertiliser salts getting into the water source.

Chloride classification of irrigation water

Chloride (ppm)	Effect on Crops
Below 70	Generally safe for all plants
70-140	Sensitive plants show injury
141-350	Moderately tolerant plants show injury
Above 350	Can cause severe problems

Table 1

	Test Method	Suppliers	Implications	Treatment
pH *The pH of water is a measure of hydrogen ion concentration (H+) and indicates its acidity or alkalinity measured on a scale of 1 to 14. A neutral pH is 7. Most water has a pH between 6.5 and 8. Water above 8 is **alkaline** and water below 6.5 is **acidic.***	Test strips in field (calibrate test strips against lab test on first use)	Testkits.com.au alloratestkits.com.au teststripsonline.com.au selectscientific.com.au Your agricultural supplier	Alkaline water (>pH 8) can break down some chemicals through a process called alkali hydrolysis. In the case of some herbicides this actually improves efficacy, but it is likely to reduce the efficacy of many other agricultural chemicals. The longer a mixed chemical is left in the tank prior to spraying, the greater the breakdown; it is not recommended to leave spray mixes overnight. Acidic water can affect the stability and physical properties of some chemical formulations.	Water pH can be changed by adding an acid or alkaline to the water tank. Using an acid such as sulphuric or phosphoric acid will lower pH while addition of an alkaline such as potassium hydroxide will increase pH. This has to be done precisely using calculated amounts depending on the pH change required. Do not guess. Critical pH levels at which chemical efficacy is compromised should be included on pesticide labels.
Total hardness	Test strips in field (calibrate test strips against lab test on first use)	Testkits.com.au alloratestkits.com.au teststripsonline.com.au selectscientific.com.au Your agricultural supplier	Chemicals with amine formulations, which include the herbicide glyphosate, are adversely affected by hard water. The solubility of the herbicide is reduced which leads to it being less absorbed by the weeds. Hard water can cause some chemicals to precipitate and can affect the properties of surfactants, emulsifiers and wetting agents as well as block nozzles and pre-filters.	To "soften" hard water use softening agents, adjust pH and use water that is neither very hot nor very cold temperatures. Add Ammonium sulphate to hard water in spray tank before adding amine formulation herbicides. This will improve efficacy.
Turbidity or dirty water *Dam or river water often contains suspended particles of clay, silt and fine organic matter, giving the water a "muddy" appearance.*	Field test in a jar or bucket	As a general rule, if a 10 cent coin cannot be seen in the bottom of a bucket of water it is too dirty for use with products affected by dirty water	Diquat, Paraquat and Glyphosate are all seriously impacted by dirty water due to the clay colloids suspended in the water. Muddy water which is not sufficiently filtered can also cause problems by blocking nozzles and pre-filters, as well as causing additional wear of spray rigs.	Filtering water and settling it in a holding tank prior to use can help to reduce turbidity. Use a "flocculent" such as Alum (aluminium sulphate) to settle out the very light particles. DO NOT use water treated with Alum to spray amine formulation chemicals e.g. Herbicides. Filter the water before filling the spray tank. Alum is most effective at pH 6.8 - 7.5 and should not be used if water pH is less than 5.5.
Salinity EC	Use a calibrated EC meter or use a professional Laboratory testing service *N.B. Remember that temperature of the sample may play a key part in the testing regime so you may want to invest in your own on-farm test equipment if you do not have ready access to a laboratory. All laboratories accredited by the National Association of Testing Authorities (NATA) are listed on their website nata.com.au*	QLD phosynanalytical.com.au symbiolabs.com.au NSW tweed.nsw.gov.au/TweedLab dpi.nsw.gov.au	Salty water can cause blockages and corrode the metal parts of spray rigs. High salt levels, particularly chloride, can lead to burning of crop foliage. High levels of salinity (above 1000ppm sodium chloride or ECs above 500-1000 mS/cm) can result in some chemicals precipitating out of the solution and others being inactivated. It can also make it difficult to adjust pH using buffers.	Salty water can be mixed with fresh water to reduce EC levels to more suitable levels for spraying. Often the only solution with highly saline water is not to use it for spraying and use clean rain water instead.

COLLECTING WATER SAMPLES FOR TESTING

- Use a clean container of at least 500mL size
- Rinse the bottle a minimum of four times with the sample water (emptying it away from the sample site)
- Collect the water as follows:
  - **A new bore or well** – Sample after pumping for several hours
  - **An operating bore** – Sample after running the pump for 30 minutes, collect as close as possible to the head of the bore.
  - **A stream** – Sample main stream flow
  - **A dam or lake** – Sample away from the edge and near the suction inlet to the pump. Ensure water is well mixed and filtered, or sample various depths
- Fill the bottle to the top, leaving little or no air space, and seal tightly
- Label the bottle accurately with where the sample was taken, the date and intended use
- Wrap the sample in aluminium foil to prevent UV light from degrading the sample