

Spray water quality



When you mix and apply agricultural chemicals use the cleanest water available. Generally the water should not be used unless it is suitable for irrigation. Poor quality water can:

- reduce the effectiveness of some agricultural chemicals;
- damage spray equipment by blocking lines and nozzles; and
- increase wear and tear on your machinery.

Effects of water quality

Water quality depends on the source of the water (dam, river, bore and aquifer) and the season (for example, has there been heavy rain or drought?).

Several characteristics of water quality affect chemical performance.

Dirt: Dirty water has very small soil particles (clay and silt) floating in it. The particles are so small that they do not sink to the bottom but remain suspended. They can adsorb and bind the chemical's active ingredient and reduce its effectiveness (this applies especially to glyphosate and paraquat).

Dirt can also block nozzles, lines and filters, reduce the sprayer's overall performance and increase wear and tear on your machinery.

Water hardness: Water is termed hard when it has a high percentage of calcium and magnesium.

Hard water can cause some chemicals to precipitate. Chemicals that tend to do this often have agents added to overcome this problem.

Hard water can also affect the balance of the surfactant system and affect properties such as wetting, emulsification and dispersion.

Very hard water can also reduce the efficiency of agents used to clear dirty water.

pH: is a measure of acidity and alkalinity scaled on a range between 1 and 14. A pH of 7 is neutral, less than 7 is acid and more than 7 alkaline. Most natural waters have a pH between 6.5 and 8.

In highly alkaline water (pH>8) many chemicals undergo a process called **alkaline hydrolysis**. This process causes the breakdown of the active ingredient into other compounds which can reduce the effectiveness of the pesticide over time. This is one reason why spray mixes should not be left in spray tanks overnight.

Very acid water can also affect the stability and physical properties of some chemical formulations.

Table 1 lists some common agricultural chemicals and their stability with respect to pH.

Dissolved salts: The total amount of mineral salts dissolved in water is usually measured by the electrical conductivity (EC) of the water.

The EC of bores and dams depends largely on the salt levels in the rock and soil that surrounds them. During a drought the salinity of water increases.

Very salty water can cause blockages in equipment. It resists any change in pH.



Organic matter: Water containing a lot of organic matter (such as leaves or algae) can block nozzles, lines and filters. Algae can also react with some chemicals, reducing their effectiveness.

Temperature: Very hot or cold water can affect the performance of some chemicals.

Testing water quality

You need to test your water to see whether it will affect the performance of chemicals.

Home testing

You can test for pH or EC yourself with kits or meters purchased from produce, hardware or pool stores. These tools need to be regularly calibrated to give accurate results.

Sending samples away

You can also send your water away for testing. The company undertaking the test will be able to recommend improvements you can make.

To send your water away for testing, follow these simple steps:

- Use a clean container (500 mL minimum).
- Rinse the bottle four times with the sample water, remembering to empty the rinse water away from the sample site.
- Follow sampling guidelines (see Table 2).
- Fill the bottle to the top, leaving little or no airspace and seal tightly.
- Label the container and indicate what the water will be used for (for example: domestic or stock consumption, irrigation or spraying) as this will affect interpretation of results.

Table 1. Some common agricultural chemicals and their stability with respect to pH

While this list provides an indication for these chemicals, it is important to contact the manufacturer for current recommendations

Common chemical name [Active ingredient]	Comments
Herbicides: Atrazine Diquat Glyphosate Paraquat Simazine	Decomposes slowly in alkaline solution, more rapidly if lime is present. Stable in neutral or acid solutions, but decomposes in alkaline conditions. Performs best at pH 3.5 to 4. Stable in neutral or acid solutions, but decomposes in alkaline conditions. Decomposes slowly in alkaline solution, more rapidly if lime is present.
Insecticides: Chlorpyrifos Dicofof Dimethoate Endosulfan Fenthion Malathion Methomyl Omethoate	Stable in neutral and weakly acidic conditions. Stable at pH 5.5 to 6. Decomposes in alkaline conditions – presence of iron accelerates decomposition. Undergoes some degree of alkaline hydrolysis. Incompatible with alkaline material. Hydrolysed rapidly in alkaline conditions. Performs best at pH 5 to 6. Presence of iron accelerates decomposition. Stable in slightly acidic solutions. Undergoes alkaline hydrolysis.
Fungicides: Guazatine Iprodione	Unstable in alkaline conditions. Undergoes alkaline hydrolysis. Performs best at pH 7.
Other Bacillus thuringiensis Gibberellic acid	Incompatible with highly alkaline material. Should not be combined with alkaline materials.

Source: B. L. Bohmont, 1990. The Standard Pesticide User's Guide. From information supplied by Loveland Industries, Colorado.

Table 2. Sampling guidelines

A new bore / well:	sample after pumping for several hours.
An operating bore:	sample after pumping 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 edge and near the suction inlet to the pump. Dam water often settles into well-defined layers – so either sample layers separately or stir up the water. Filter the water to get rid of any organic matter.

Improving water quality

You need to test your water to see whether it will affect chemical performance. The company undertaking the test will be able to recommend improvements you can make.

There are commercial products available to reduce pH, soften hard water and clear dirty water. To reduce the effects of very salty water you may need to mix it with better quality water from other sources.

For more information

Always refer to the pesticide label first for information on the quality of water to use when mixing. If there is no information contact your chemical reseller or the manufacturer of the pesticide for advice.

For information on companies undertaking water testing contact your local NSW DPI office or agricultural supplier.