# Table: How to test water quality and treat key issues

| Water quality components | How to test | Issue(s) arising | Treatment options |
|---|---|---|---|
| **Turbidity**<br>Turbidity describes the cloudiness or haziness of water.<br><br>It is caused by suspended particles of clay, silt and fine organic matter. | **Basic test method**<br>1. Collect water sample in a clear bottle<br>2. Let it sit for a couple of days<br>3. Look closely to see if suspended particles have settled out<br><br>**More accurate test method**<br>Turbidity meters are available from retailers of scientific equipment. | 1. Efficacy – If herbicides bind onto soil particles, the herbicide can't be taken up by the target weed. Glyphosate is an example of a herbicide that loses efficacy when it binds onto clay particles.<br><br>2. Blockages – Soil particles block nozzles and pre-filters. | 1. Use a settling tank to get heavier particles to sink to the bottom.<br><br>2. Use a flocculant such as Alum (Aluminium sulphate) to settle out very light particles. Alum has an effective range of pH 5.5–7.5 and loses its effectiveness above or below these values. |
| **Hardness**<br>Hardness is caused by dissolved calcium, magnesium, iron or sodium. Hardness is measured as the | **Basic test method**<br>Mix pure liquid soap (e.g. Castille soap) into your water sample and shake it well. | 1. Hard water can cause some chemicals to precipitate. The precipitates can block nozzles and pre-filters on spray rigs. | 1. Add commercial chemical softening agents e.g. ammonium sulphate (AMS).<br><br>2. Adjust the pH of the water. |

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| concentration of calcium carbonate in water, and reported in mg/l or parts per million (ppm).<br><br>"Soft" water has $CaCo_3$ less than 50mg/l.<br><br>Very "hard" water could have as much as 300mg/l of $CaCO_3$.<br><br>High levels of calcium and/or magnesium are common in bore water. | Soft water lathers up well and the water stays clear.<br>Hard water becomes milky or cloudy with no suds.<br><br>**More accurate test method**<br>Test strips are used to test water hardness in pools or aquariums, and are a simple and reliable way to rate your water hardness. These are also available from irrigation centres.<br><br>**Most accurate test method**<br>Laboratories can test your sample. | 2. Hard water can reduce the solubility of some herbicides, and thus absorption by weeds. Glyphosate is affected by hard water.<br><br>3. Hard water can affect the properties of surfactants, emulsifiers and wetting agents. | 3. Use water that is neither very hot nor very cold.<br><br>4. When mixing, fill the tank to at least 75% capacity, then add AMS to the water. Ensure AMS is properly dissolved and dispersed in the spray tank, before adding the glyphosate or other sensitive agrichemical. If the AMS is not dissolved, the risk of tank mix incompatibility increases. |
| **pH – Acidity/Alkalinity Indicator**<br>pH is a number from 0–14 that identifies how acidic or alkaline a solution is.<br><br>A neutral pH is 7. | **Easy test method**<br>Test strips used for testing pH in pools or aquariums are a simple a reliable way to rate your water hardness. These are also available from irrigation centres. | **Low pH**<br>1. The optimum pH for many agrichemicals is when the spray mix is slightly acidic (pH 5.5–6.5).<br><br>2. Copper becomes more soluble as water becomes more acid. Copper ions in solution can | 1. Check product labels: If the label doesn't indicate an optimum pH for that agrichemical, ask your reseller or agronomist (see table with indicative pH guidelines below).<br><br>2. Test the pH of your supply water. |

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| If pH is less than 7 (“low”), the solution is acidic.<br><br>If pH is more than 7 (“high”), the solution is alkaline.<br><br>Water supplies to Australian vineyards typically range between 6.5 to 9, depending on the source.<br><br>Chemicals mixed into water can also change the pH. | **More accurate test method**<br>Hand-held pH meters are relatively cheap and available from chemical resellers or retailers of scientific equipment.<br><br>**Most accurate test method**<br>To get accurate results use a laboratory to test your sample. | become phytotoxic. At pH, copper is insoluble and remains safer on plant surfaces, while still providing gradual copper availability for disease control. Hence copper fungicides are formulated to stay at pH 7.<br><br>**High pH:**<br>3. Some agrichemicals undergo chemical breakdown (hydrolysis) if they are mixed into water with a pH above 7.<br><br>4. Hydrolysis can happen very quickly, and significantly reduce an agrichemical’s effectiveness, even before you start spraying.<br><br>**pH can damage pipes and fittings**<br>5. pH less than 6 can cause corrosion of metal pipes and fittings.<br>6. pH higher than 8 can cause deposits leading to blocked hoses and nozzles. | 3. Add buffering agents or acidifiers to correct the pH.<br><br>4. Manipulation of the pH needs to be done precisely, using calculated amounts of acidifiers/buffers as per label.<br><br>5. Check pH of the tank mix again after adding agrichemicals, to ensure the pH is still in the 6–8 range, as adding chemicals can change the pH of a mixture. |

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| **Salinity**<br>Salinity is caused by soluble salts in the water, measured in electrical conductivity (EC) or µS/cm. | **Easy test method**<br>EC meter from resellers, hardware stores, pool and irrigation centres.<br><br>**Published information**<br>Murray–Darling Basin irrigators can check salinity readings, updated every 24 hours by the Murray–Darling Basin Authority here. | 1. Saline water can cause blockages and corrode the metal parts of spray rigs;<br>2. high levels of chloride salts may burn foliage<br>3. Most chemicals are not affected by low to medium salt levels. | 1. In some situations, saline water can be mixed with fresh water to reduce EC levels. |
| **Organic matter**<br>Including blue green algae. | Some current, monthly information for the Murray Darling Basin can be found when searching for water quality threats here | 4. Organic matter in water can block nozzles and pre-filters.<br>5. High levels of algae can increase the pH of water.<br>6. Agrichemicals may bind to organic matter in a spray tank mix, and become less effective against the target pest or disease or weed. | Filter water before filling spray tanks, using:<br>• media filters (1mm crushed basalt) or<br>• disc filters (60-micron openings) |
| **Iron**<br>Iron is soluble in water with little to no oxygen, typically deep bores and dams. | **Easy method**<br>1. Take a filtered sample of groundwater in a clear open topped glass jar. | 1. Above 1.5ppm (1.5mg/L) iron in water, deposits in pipes and equipment occur. | A three-step process is recommended:<br>1. **Oxidation** using aeration, chlorine or potassium permanganate to convert soluble iron into an insoluble form that can be removed. |

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| | 2. Let it stand overnight.<br>3. Iron causes a brown stain appears near the waterline, or a rusty sediment.<br><br>**More accurate test method**<br>Test strips for testing iron and other metals are available. | 2. Between 0.3 to 1.5 ppm, iron – loving bacteria can grow and cause blockages in pressure gauges and other equipment.<br><br>3. Above 4 mg/L can cause phytotoxicity. | 2. **Sedimentation** – to allow the insoluble iron to precipitate out so it can be physically separated from the water<br>3. **Filtration** to remove any particles from the water. Sand media is recommended for removing iron particles from irrigation water and equally suitable for tank mixing water. |
| Temperature of water | Thermometer or for the Murray Darling Basin here | 1. Extremes in temperature can increase the negative effect of other water quality factors.<br><br>2. Cold water causes some chemicals to gel, reducing the solubility of wettable granule formulations.<br><br>3. Hot water affects the stability of some chemical mixtures. | 1. If possible, avoid mixing sprays during extreme temperature situations.<br><br>2. On hot days, let the water flow through the hose to get rid of the hottest water. |

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