Water for Profit

EFFECT OF WATER QUALITY ON MICRO-IRRIGATION MAINTENANCE

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The quality of irrigation water has a major impact on the maintenance requirements and life expectancy of micro-irrigation systems.

Sampling

It is important that a representative water sample is collected. If the water source is a bore, the sample should be collected after the pump has run for at least half an hour. If the sample is collected from a surface water supply (dam, river or channel) the sample should be taken from below the surface near the centre of the water source. If the source varies throughout the season, then the sample should be collected at the worst time of year.

Thoroughly cleaned and rinsed sealable glass containers (which hold more than two litres) are preferred. Two samples should be collected at any one source. One sample will be used for tests for salinity, sodium, calcium, magnesium, manganese, boron, bicarbonate, carbonate, chloride, sulphate, sulphide, quantity and size of suspended solids and pH. No additives are required. The other sample is used for iron analysis. After collecting the water, 10 drops of HCl should be added. HCl is commonly available as muturic acid.

Sample bottles should be filled completely with all air removed, sealed, labelled clearly and sent immediately to a testing laboratory.

Interpreting laboratory results

Suspended solids in a water sample may be soil solids (e.g. fine clays to coarse sands), organisms (e.g. algae and bacteria) or a wide range of other matter. From this data, the total quantity of material to be removed can be estimated.

Saline irrigation water reduces crop productivity over time as salts accumulate in the plant root zone. Salinity may be expressed as electrical conductivity (EC) in micromhos per centimetre (mmho/cm) or as total dissolved solids (TDS) in ppm. Refer to the information sheet on Irrigation Unit Conversions. Some crops are more sensitive to salt than others.

pH of an irrigation water source that is between 6.5 to 8.5 does not usually present any problems. However, pH outside this range can result in undesirable chemical reactions that may affect the irrigation system (e.g. precipitation of calcium carbonate or iron) which may block the emitters. The pH may help or hinder the action of chlorine to control biological growth, and it may play a role in soil nutrient availability to the crop.

Magnesium (Mg) is found in all natural waters. Often laboratories will not separate Ca and Mg but will report simply Ca+Mg in me/L. The Ca and Mg ratio is often important. If the Ca/Mg ratio is less than 2.0 then there may be infiltration problems.

Sodium (Na) salts are very soluble and are found in most natural waters. A soil with a large amount of Na associated with the clay fraction has poor physical properties for plant growth. When these soils wet, the clay particles run together, becoming sticky and almost impervious to water. This is called a sodic soil. Continued use of water with a high fraction of Na will degrade a healthy soil.

Iron (Fe) may be present in a soluble (ferrous) form and may create emitter clogging problems at concentrations as low as 0.1 ppm. Dissolved iron may precipitate out of the water due to changes in temperature and pressure, due to an increase in pH, or through the action of bacteria. The result is a sludge or slime which may reduce system performance.

Manganese (Mn) occurs in groundwater less commonly than iron, and generally in smaller amounts. Like iron, dissolved manganese may precipitate in the system due to chemical or biological activity, forming a sediment that can block emitters. A dark brown sediment indicates that there is a mixture of Mn and Fe, and a black sediment is pure manganese oxide. Mn in the supply system should be treated with chlorine to prevent the development of a precipitate.

Calcium (Ca) is found in all natural waters. Ca dominant soils are friable and easily worked, promote water infiltration and do not puddle when wet. Generally water with high dissolved Ca is preferred. For this reason gypsum is applied to “tight” soils.

Bicarbonate (HCo3) is common in natural waters. Sodium and potassium bicarbonates exist as solid salts, for example baking soda (sodium bicarbonate). Calcium and magnesium bicarbonates only exist in solution. When a soil dries, bicarbonates are chemically changed into insoluble deposits and sodium takes its place. High bicarbonate irrigation can change a calcium dominant soil into a sodium dominant soil.

Potassium (K) is only found in small amounts in natural waters. It behaves much like Na and may not be reported separately.

Carbonate (Co3) is found in some waters. Carbonate water use in irrigation will often turn a soil sodic as does a bicarbonate.

Chloride (Cl) is found in all natural waters. In high concentrations it is toxic to some plants. All common chlorides are soluble and add to the total salinity of the soil.

Sulphur bacteria may grow in the irrigation system, forming masses of slime which may clog filters and emitters where the irrigation water contains more than 0.1 ppm of total sulphides.

Sulphate, boron and nitrate all affect plant health but have no adverse reactions that may cause the drip system to fail.

Information was obtained from the Hardie Micro-irrigation Design Manual *by M J Boswell and* Fertigation *by C. Burt, K. O’Connor and T. Ruehr and is gratefully acknowledged*

For more details contact Growcom on 07 3620 3844.

Table 1: water quality interpretation chart

Water quality parameter	Degree of problem		
	None	Increasing	Severe
Permeability			
Caused by low salt			
EC (µS/cm)	500+	200-500	<200
TDS (ppm)	320+	<320	
Caused by sodium (SAR)	0.0 - 6.0	6.0-9.0	9.0+
Clogging			
Physical			
Suspended solids (ppm)	<50	50-100	>100
Chemical			
pH	<7.0	7.0-8.0	>8.0
EC (µS/cm)	<500	500-2000	>2000
Bicarbonate		<100	
Total iron (ppm)	0.0-0.1	0.1-0.4	0.4+
Manganese (ppm)	0.0-0.2	0.2-0.4	0.4+
Sulphides (ppm)	0.0-0.1	0.1-0.2	0.2+
Biological			
Bacteria population per litre	<10000	10000-50000	>50000

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