Irrigation Water Test Interpretation

Regular on-site irrigation water testing is recommended for all production nurseries, but the limitation of this testing is it doesn't show the amount of specific nutrients present in the water.

While water quality may fall within acceptable limits for pH and Electrical Conductivity (EC) there may be specific nutrients, or other parameters, that fall outside the range suitable for production nursery irrigation water. A full laboratory analysis is required to determine the levels of these nutrients. For example, EC, a measure of the total amount of salts in a water source, doesn't provide information on which salts are present, if the salts are beneficial or not, or if individual elements are present in excessive amounts.

Knowing this information allows the fine tuning of nutritional programmes and assists in identifying potential problems so they can be effectively addressed before having an impact on plant production and quality. These tests can be used as a guide for the addition of liming material, base and controlled release fertilisers to the growing media, and assist in formulating an effective fertigation program.

Regular laboratory analysis can provide early indications of changes in water quality, allowing timely corrective action to be taken. The information gained from these tests is particularly valuable in production nurseries recycling their irrigation water in determining which nutrients should be added, and if there are useful amounts of other nutrients. Regular full analysis should be done at least annually, however it is recommended that this type of testing occurs every 6 months.

When interpreting the results of these tests, alkalinity and bicarbonate levels are of particular interest because of their effects on changing the pH (pH drift) of growing media, the potential clogging

hazard of pipes and emitters, and staining of containers and plants. Iron present at more than 1 ppm can cause staining and be a potential clogging hazard. Other nutrients of particular interest are calcium, magnesium, copper, sodium and chloride.

The following is a table containing values adapted from the EcoHort Guidelines along with some interpretation comments. The table gives additional information on parameters that will be useful in interpreting the results of the tests. The laboratory will usually give an interpretation of how suitable the water is for the intended use, and general guidelines on how acceptable the results are.

More information on irrigation water quality can be found in the EcoHort Guidelines or on the NGIQ Technical Information Library webpage - http://www.ngiq.asn.au/technical-information/

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Parameter	Unit	Low	Medium	High	Comments
Nitrate (NO3)	mg/L		10	100	Particularly important in recycling systems. High levels need to be taken into account in fertiliser programmes.
Potassium (K)	mg/L				Adjust potassium if recycling. Potassium should be 2-5% of cations (calcium, magnesium, potassium and sodium).
Ammonium nitrogen (NH4)	mg/L			10	High levels can lead to direct toxicity and contribute to downward pH drift.
Phosphate (P)	mg/L		1-15	40	Less than 15mg/L for phosphate sensitive plants
Chloride (Cl)	mg/L		70-90	200	Causes tip and marginal burns at higher levels in low leaching situations.
Electrical Conductivity (EC)	dS/m	0.3*	0.6	1.0	The overall level of salts. If the high EC is from plant nutrients a higher result may be acceptable. Results above 0.6 will see reduced growth and/or marginal leaf burns in sub-irrigation, low leaching situations and on sensitive species.
Bicarbonate	mg/L		60	90	Increasing problems with plant growth, and plant and container staining. At levels between 90 and 200 liming materials in the growing media need to be adjusted accordingly,
Alkalinity (CaCO3)	mg/L	40	60	250	Alkalinity is the ability of the water to neutralize acids. As alkalinity levels rise, the ability of the water to raise the pH of the growing medium also increases.
pH		5		7.0	pH results need to be considered with alkalinity to determine the ability of water to change growing media pH.
Calcium (Ca)	mg/L				High levels can interfere with magnesium availability. Ideal Ca:Mg ratio 2:1. Calcium carbonate may form scale.
Boron (B)	mg/L			0.3	Plants vary greatly in their tolerance to boron.
Manganese (Mn)	mg/L			0.2	Concentrations as low as 0.05 mg/l can lead to bacterial slime growth in pipes.
Copper (Cu)	mg/L	0.02*	0.05	0.2	Levels may rise where copper compounds are used for sterilisation or algal control in recycled systems.
Magnesium (Mg)	mg/L				The level of magnesium needs to be considered in conjunction with calcium and sodium levels. Ideal Ca:Mg ratio 2:1.
Sulphate (SO4)	mg/L			250	Sulphur levels will be increased by the use of alum.
Zinc (Zn)	mg/L	0.2*		2	
Sodium (Na)	mg/L	60		100	Calcium, magnesium and potassium need increasing with high levels of sodium.
Iron (Fe)	mg/L	0.3*		1	From an acidified sample. Increasing problems with staining of plants and clogging of pipes at levels above 0.3, particularly in trickle irrigation systems. Polyphosphate can be injected to form a soluble compound that allows iron to pass through the irrigation. Aeration and chlorination produce insoluble iron which can be settled out.
Sodium Adsorption Ratio (SAR)				3	This measure indicates the ability of the water to reduce calcium, magnesium and potassium availability.
Aluminium (Al)	mg/L			5	Monitor if using alum for flocculation. High concentrations may cause phosphorous deficiency.
Fluoride (Fl)	mg/L			1	High levels will damage sensitive plants.
Molybdenum (Mo)	mg/L			0.01	
Total Dissolved Solids (TDS)	mg/L			500	A measure of the combined content of organic and inorganic substances.
Suspended Solids	mg/L			50	Small solid particles which remain in suspension.

Note: mg/L is milligrams/litre. Equivalent to parts per million (ppm)
Not all of the above parameters will appear in all tests.
* In sub-irrigation and trickle irrigation systems the low level is the appropriate level.

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