The Nursery Papers

BROUGHT TO YOU BY THE NURSERY INDUSTRY LEVY

EDITED BY RICHARD STEPHENS. INDUSTRY DEVELOPMENT MANAGER. ISSN:1326-1495

NGIA

Horticulture Australia

ISSUE NUMBER: 2002/11

Water quality and nursery crop nutrition

Nursery crop nutrition can be significantly affected by the quality of irrigation water. As a result, particular attention must be paid to water quality and its interaction with applied fertilisers, especially fertigation. This *Nursery Paper* should be read in conjunction with the two accompanying *Nursery Papers*; 'Supplying crop nutrition through fertigation', issue number 2002/12, and 'Supplying crop nutrition through controlled release fertilisers', issue number 2002/13.

Managing nursery crop nutrition becomes more and more complex as water 'quality' declines. Any nutritional program designed in the absence of objective analytical data, such as water quality characteristics, is risky, and asking for trouble.

Fertigation techniques enable fine-tuning of crop nutrition but in the absence of water quality information provides a lethal weapon that can very easily get out of control.

Specific ion effects

Electrical conductivity (EC) is a good measure of the level of combined salts present in water, either at the irrigation source and following the addition of fertilisers. However, the EC does not indicate whether these dissolved salts are present as 'friendly' nutrients, damaging substances (such as chloride, sodium, bicarbonate) or as toxic amounts of iron, copper, zinc, boron, fluoride, etc.

An EC of 2.0dS/m (deci-semen/metre) for a properly prepared fertigant solution using good quality water is due to the presence of friendly salts. Therefore it is not an indication of a problem unless it is used in frequent subirrigation.

However, an EC of 2.0dS/m for water at the irrigation source (for example, creek, dam or bore) indicates a major problem. It is therefore important to have a complete analysis performed by a competent and independent laboratory.

The regularity of such complete analysis should be determined by known or suspected changes in water quality at the irrigation source, which may be seasonal.

Table 1 (on next page) presents some important interpretive data on water quality for nurseries. Note that the information in Table 1 assumes that the irrigation water source is used on a constant basis, is not being recirculated and is not delivered through a sub-irrigation system.

The bottom line

Without knowing the quality of your irrigation water and associated effects from interaction with fertilisers and nutrients, it is very easy to inadvertently inhibit plant growth.

By gaining analytical information on the characteristics of your water from a competent water analysis laboratory and regularly monitoring changes in water quality (pH and EC measurements are good indicators), you can optimise your crop nutrition efficiency.

Table 1: Irrigation water quality guidelines for nursery crops		
Parameter	**Level**	**Comments**
PH	5.5 – 7.0	Suits most irrigation types.
	<5.0	Corrosive, phytotoxic, expect nutritional problems later in crop cycle if pH not corrected.
	>7.2	Build up of deposits in irrigation equipment, on plants, pots, plastics, problems with chlorine use, nutrient imbalances in plants.
Electrical Conductivity (EC) (dS/m) **Note:** these figures do NOT apply to fertigated water	<0.3	Suits all irrigation conditions.
	<0.6*	Suits most conditions, but limiting in subirrigation systems and low-leaching situations.
	0.8**	Reduced growth and/or marginal leaf burns may occur.
Chloride (mg/L)	<70-90	Suits most situations and slow downward pH drift.
	>200**	Tip and marginal burns to lower foliage in low leaching situations. Controlled leaching may alleviate problems at lower end of scale.
Sodium (mg/L)	<60	Usually no problems.
	>120**	Feeding program needs to be modified to include increased amounts of calcium, magnesium and potassium. Leaching required.
Alkalinity (mg/L CaCO3)	60	Good.
	>125	May cause 'in crop' pH to rise to unacceptable levels in later crop cycles.
Bicarbonate (mg/L)	<90	Suitable.
	90-200	Increasing problems with plant growth and foliage/container staining. Adjust rate of liming material accordingly.
	>500	Unsuitable.
Fluoride (mg/L)	<1.0	Higher will damage sensitive plants.
Aluminium (mg/L)	<5.0	Higher will damage sensitive plants.
Iron (mg/L)	<0.3	No problems expected.
	>0.3*	Problems increase with trickle irrigation systems.
	>1.0**	Staining of foliage, pots, plastics.
	>3.5	Treatment required.
Boron (mg/L)	<0.3	Generally suitable.
	>0.5*	Increasing problems, particularly in poorly leached situations.
	2.0**	Unsuitable.
Manganese (mg/L)	<0.2	Suitable in most situations.
	>0.5**	Increasing problems.
	15*	Upper limit for plants already supplied with P at moderate levels.
Copper (mg/L)	<0.02	Generally suitable.
	>0.05*	Becoming excessive.
	>0.2	Increasingly toxic.
Ammonium-N (mg/L)	<10	Generally suitable.
	50	Probably excessive – leading to direct toxicity and downward pH drift.
Zinc (mg/L)	0.2*	Generally suitable.
	>2.0	Increasingly toxic.
NOTE: * Take extra care if trickle and subirrigation are used. Expect problems in rainout situations if precautions are not observed. **Unsuitable for trickle and sub-irrigation of containers and rainout situations		

Further reading

Rolfe, C, Yiasoumi, W & Keskula, E 2000. *Managing Water in Plant Nurseries,* second edition, NSW Agriculture.

Bodman, K & Sharman, K 1993. *Container Media Management*. Queensland Nursery Industry Association. Brisbane, Australia.

Acknowledgements

The information in this *Nursery* Paper was supplied by Keith Bodman, WA Horticulture and Environmental Science Skills Centre. Input was also received from Dr Geoff Cresswell, Cresswell Horticultural Services.

Nursery & Garden Industry Australia

Horticulture Australia