Technical Bulletin

Water Quality and Alkalinity Guidelines
J.R. Peters Laboratory

THE LEVEL OF ALKALINITY IN THE WATER.

A simple way to think of alkalinity is as the ability of your water to neutralize acid. The higher the alkalinity, the more acid it will take to lower the pH of your water. Alkalinity is composed of bicarbonates, carbonates and hydroxides joined to calcium, magnesium or sodium. These are the same components found in antacids, such as Tums or Rolaids, baking soda, limestone and lye. Alkalinity is expressed as ppm calcium carbonate equivalent. The higher the number, the more of these components there are in the water. Alkalinity levels are of more concern for crops grown in small containers and for those grown for a long period of time. Table 1 lists recommended alkalinity ranges for various container sizes.

TABLE 1. J.R. PETERS LABORATORY ALKALINITY GUIDELINES

CONTAINER SIZE	RECOMMENDED RANGE		LEVEL OF CONCERN[1]	
	ppm=mg $CaCO_3$/L	Milliequivalents[2] $CaCO_3$	ppm=mg $CaCO_3$/L	Milliequivalents $CaCO_3$
Plugs	60-100	1.2-2.0	<40, >120	<0.8, >2.4
Small pots/Shallow flats	80-120	1.6-2.4	<40, >140	<0.8, >2.8
4” to 5” pots/deep flats	100-140	2.0-2.8	<40, >160	<0.8, >3.2
Pots ≥ 6”/long term crops	120-180	1.6-3.6	<60, >200	<1.2, >4.0

[1] Alkalinity levels are intended as guidelines only and are dependant on the plant and media type, pot diameter/size, acidity of the feed program and watering practices.
[2]Milliequivalents=ppm total alkalinity expressed as mg $CaCO_3$/ liter divided by 50.

High alkalinity water may cause a gradual increase in the growing media pH. As the pH climbs, availability of certain plant nutrients, particularly the micronutrients like iron and manganese are negatively affected resulting in deficiencies. It may be necessary to inject mineral acid (sulfuric or phosphoric) into the water or to use acidic media amendments, such as sulfur, or “acid-forming” fertilizers. To determine the amount of mineral acid you need to use to reduce the alkalinity of your water, access the alkalinity calculator located on the web on the North Carolina State University website at http://www.floriculturein fo.com/ and clicking on the floriculture software link. **Do not use water that has been water softened.** Water softeners add harmful sodium while removing desirable calcium and magnesium. Water softeners do not reduce water alkalinity.

Low alkalinity water usually lacks the components that neutralize acid. As a consequence, the continued use of potentially acidic fertilizers, like many all-purpose formulas, may result in an undesirable decrease in the pH of the growing medium. As the pH drops, certain plant nutrients like iron and manganese may become available in toxic amounts. In addition these waters are often deficient in calcium, magnesium or sulfate and additional supplements may be needed. A fertilizer program that alternates a potentially basic fertilizer containing calcium and magnesium with a low potential acidity fertilizer can help prevent pH crashes in the growing media and supply needed nutrients.

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THE QUALITY OF YOUR GREENHOUSE WATER.

TABLE 2. J.R. PETERS LABORATORY WATER QUALITY GUIDELINES

	PARAMETERS	NORMAL RANGE	LOW	HIGH
MACROS	Soluble Salts (mmhos/cm)	0.3 to 1.0	<0.2	>1.3
	Nitrate Nitrogen (NO3-N)	-----	-----	>10
	Ammonium Nitrogen (NH4-N)	-----	-----	>10
	Phosphorus (P)	-----	-----	>10
	Potassium (K)	-----	-----	>10
	Calcium (Ca)	40 to 75	<25	>100
	Magnesium (Mg)	30 to 50	<15	>50
	Sulfur (S)	10 to 80	<10	>80
TRACES	Manganese (Mn)	-----	-----	>1.50
	Iron (Fe)	-----	-----	>2.00
	Copper (Cu)	-----	-----	>0.20
	Boron (B)*	-----	-----	>0.50
	Zinc (Zn)	-----	-----	>0.40
	Molybdenum (Mo)	-----	-----	>0.20
OTHER	Sodium (Na)	-----	-----	>50
	Chlorides (Cl)	-----	-----	>70
	Fluorides (F)	-----	-----	>1.0
	Aluminum (Al)	-----	-----	>1.0

*Poinsettias are sensitive to boron. A level equal to or greater than 0.25 ppm may be considered high and could cause toxicity.

Nitrogen, phosphorus, and potassium levels greater than 10 ppm may indicate contamination of the water source, possibly due to nutrient runoff; however there is no negative effect on plant growth if these nutrients are present.

High levels of trace elements and other elements, such as sodium and chloride, in irrigation water may result in plant toxicity. Consult with a water treatment specialist to determine the source of these elements and appropriate treatment methods.

REFERENCES:

Biernbaum, J.A. 1994. Water quality. In Tayama, H.K., T.J. Roll, and M.L. Gaston. Eds. Tips on growing bedding plants, 3rd ed., Ohio Flor. Assoc., Columbus , OH .

J.R. Peters Laboratory; Data complied from statistical analysis of testing results (1989-2006).

6/2007