Common water quality problems encountered in the greenhouse

Richard J. McAvoy
Extension Floriculture Specialist

The quality of water used for irrigation directly affects crop growth in the greenhouse. Water quality is related to both the mineral and chemical content of the water. Assuming the irrigation water is free of chemical contamination, the mineral content of the water is the factor of most concern to greenhouse growers.

Greenhouse crops, growing in peat-lite media, respond rapidly to changes in the nutrient solution which surround the roots. The mineral content of the irrigation water will affect the nutrient content of this solution and subsequently, the growth of the crop. Undesirable effects on crop growth result when the mineral content of the water is either too high or too low.

Excessively high and excessively low mineral levels in irrigation water result in conditions typically referred to as alkalinity and acidity, respectively. Alkalinity is often associated with a high calcium and magnesium content and a high pH. Acidity or pure water is associated with low calcium and magnesium contents and often excessively high levels of metals (manganese, zinc, iron, boron, etc). Both conditions can cause problems for the grower and both problems can be overcome with proper management practices.

In Connecticut, water quality varies greatly. Although waters in the northeast are generally thought of as pure or acidic, tests indicate (Connecticut State Department of Health *Analyses of Connecticut public water supplies*) that many drilled wells produce water with alkalinity levels over 200 ppm calcium carbonate equivalents. Levels above the 100-140 range are considered undesirably high.

Alkaline water increases the pH of the growing medium and decreases the availability of micronutrients to the plant. Micronutrient deficiencies reduce growth and cause chlorotic symptoms to appear. Irrigating with even moderately alkaline water over a long period of time (3-4 months) will significantly increase medium pH (*Williams et al, 1988).* As the volume of the container decreases and/or the frequency and volume of irrigations increase, this problem will increase.

Management strategies to combat an alkalinity problem include: (1) injecting acid into the watering system, (2) using acidifying fer-

tilizers, (3) using a constant liquid feed (with acidifying fertilizers) and (4) starting with a lower pH growing medium.

The exact management strategy one chooses depends on: (1) the alkalinity of the water, (2) the crop, (3) container size (small pots are less buffered) and (4) the length of the cropping period. All strategies must be formulated on the basis of an accurate, up-to-date water analysis.

Pure water causes sudden decreases in medium pH, decreases the level of calcium and magnesium and increases micronutrient levels in the growing medium. Micronutrient toxicities (iron, manganese, boron) result from the increased availability of metals in the nutrient solution. Molybdenum deficiencies result when medium pH is depressed. Ammonium levels increase as the low pH depresses microbial activity in the medium.

Many waters in Connecticut are acid. Irrigating with these waters, without remedial management practices, will reduce plant growth and leaf size. In severe cases, leaf burn and die-off of leaves and growing tips will result.

To combat the problems associated with pure waters: (1) increase initial pH (add more lime), (2) supplement with calcium and magnesium, (3) use fertilizers such as calcium nitrate and potassium nitrate which reduce acidity, (4) reduce the use of micronutrients, especially from fortified fertilizer formulations, (5) supplement molybdenum on sensitive crops like poinsettia, (6) test your water (and medium) regularly.

Testing your irrigation water is most important. Corrective steps are impossible until you know the actual mineral composition of your water. Tests should indicate the concentration of nitrogen (nitrate and ammonium), potassium, phosphorous, calcium, magnesium, sodium, manganese, iron, copper, zinc, molybdenum, chloride, fluoride, the alkalinity and the pH.

Two commercial water testing services include:

W. R. Grace & Co.
Peters/Terra-lite Testing Laboratory
P.O. Box 789
570 Grant Way
Foglesville, Pa 18051

Fafard Analytical Services
P.O. Box 2065
909 Amity Road
Anderson, S C 29622

There are other labs capable of testing water. Local labs which test potability of drinking water are capable of determining alkalinity and

pH, and the iron, chloride, nitrate nitrogen, calcium and magnesium content of a water sample.

References:

Analyses of Connecticut public water supplies. Eighth Edition. Connecticut State Department of Health.

Vetanovetz, R.P. and J.F. Knauss. 1988. ***Water quality.*** **Greenhouse Manager.** April pp. 64-66, 68-69,72.

Williams, B.J., J.C. Peterson, and J.D. Utzinger. 1988. ***Effects of dolomitic lime and alkaline water in sphagnum peat-based container growing media.*** **HortSci.** 23(1):168-169.