GROWERTALKS

Columns

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Alkalinity Control with Acid Injection

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This is an excerpt from the 4th Edition GGSPro Technical Reference Guide. Chapter 8, "Water Quality and Crop Nutrition," contains this and much more grower-friendly information including water and soil testing, diagnosing and treating nutritional problems, building fertilizer programs based on water quality, and injector calculations.

It's strongly recommended to treat highly alkaline water sources with acid to neutralize the alkalinity to a low level, making the water more suitable for production by reducing its ability to raise soil pH. Several options are available for acid injection, including sulfuric, phosphoric, nitric and citric acid.

The characteristics of the various acids make them more or less suitable for greenhouse use, depending on specific situations. Nitric acid is the most caustic option. For this reason, it's generally avoided in most production settings. The use of phosphoric acid results in the addition of significant amounts of phosphorus to the irrigation water. Since growers generally desire low levels of phosphorus in their water, most elect to avoid injection of phosphoric acid. For organic growers, some forms of citric acid are preferred due to their OMRI status. In most cases, the GGSPro team recommends technical or reagent-grade sulfuric acids. These forms are effective, relatively inexpensive and complement most fertility programs.

When handling acids, care must be taken to protect worker safety. Workers can be injured by direct contact with acid liquids or vapors formed by some acids, including nitric acid. Acids should only be handled in well-ventilated areas. Inhalation or ingestion of acids in liquid or vapor form must be avoided. Direct contact of acid with exposed skin and eyes can cause serious injury. Lightweight, casual clothing doesn't provide adequate protection from the corrosive action of acids. Fortunately, acids can be handled safely with proper protective gear.

Well-maintained protective gear should include the following items:

• Acid-impervious gloves, suit and boots

• Goggles or face shield

• NIOSH/MSHA-approved full-face respirator for vapor-forming acids

Acids react with water in a strongly exothermic manner, meaning the reaction between water and acid releases much energy. This can cause the solution to boil and lead to acid being dispelled from the stock container. For this reason, it's extremely important to always add acid to water and to never add water to concentrated acid. When preparing stock solutions, first fill the stock tank with the appropriate amount of water and then add the acid to the larger volume of water.

Growers that inject acid generally do so in a continuous manner. Injectors used in this way should be selected to provide lasting, reliable service and should be approved for use with acids. Multi-head injectors are convenient to use with acids and allow complete separation with other injected materials. Growers can combine acid and fertilizer stock solutions for many fertilizer types. However, calcium-based fertilizers shouldn't be mixed with acid stock solutions, as a precipitate will form and cause the injector to clog. Examples of calcium-containing fertilizer formulations include, but are not limited to, 15-0-15, 15-0-0 and 13-2-13.

The amount of acid used to neutralize acidity equates to a very dilute solution at the end of the hose, which is completely safe for contact with plants and people. However, this water isn't considered potable and shouldn't be used as or added to drinking water.

Interpretation of EC Readings Generated by 2:1 Testing*

2:1 EC Reading (mS/cm)	Comments
0-0.25	Very low – probable deficiency
0.25-0.75	Suitable for seedlings and salt sensitive plants
0.75-1.25	Desirable level for most plants
1.25-1.75	Slightly high; too high for seedlings and salt sensitive plants
1.75-2.25	Reduced growth, leaf marginal burn
1.0 mmhos/cm = 1.0 dS/m = 1.0 mS/cm	

*Adapted from Cox, D. Soil Tests –Sampling and Interpreting the Results of Greenhouse Soil Tests. Web. March 20, 2014. University of Massachusetts. http://extension.umass.edu/floriculture/fact-sheets/interpreting-results-greenhouse-soil-tests.

Using the 2:1 media testing technique

Good management of greenhouse crops requires continuous understanding of crop nutrition. At the most basic level, growers need to understand the media pH and EC to avoid fertility issues. In-house monitoring of media pH and EC is easily performed using the 2:1 testing technique. Regular and consistent testing using the procedure below provides growers with both a snapshot and a trending view of crop fertility. Combining frequent, in-house 2:1 testing with periodic laboratory services provides a full picture of crop nutrition. Remember to calibrate meters on a regular basis.

Collecting media samples

1. Remove the container, leaving the root mass and associated media as intact as possible.

2. Collect several tablespoons of media from a point in the vertical center of the root mass and towards the center of the container OR collect a core sample from the pot, retaining only the middle 50% of the core (discard the top and bottom 25%).

3. Collect samples from five to 10 pots selected randomly from as much of the crop as possible for a combined volume of 1⁄2 cup.

Testing media pH and EC

Materials needed:

• Distilled water

• Two 2-cup glass or plastic measuring cups

• pH and EC meter(s)

• Media sample(s)

Test procedure

1. Rinse container with distilled water.

2. Measure 1⁄2 cup media sample at same density as found in pots.

3. Measure one cup of distilled water and add it to the media.

4. Vigorously mix the sample.

5. Cover to prevent evaporation and allow sample to settle for 60 minutes. Use a consistent settling time across all samples and sampling events.

6. Use meters to test pH and EC of the liquid layer above the settled media. (Solution may be separated using filter paper to filter any remaining media, if desired.)

7. Rinse container thoroughly before storing or processing the next sample.

Understanding results

When comparing test results performed by a commercial lab that uses a saturated media extract (SME) method, 2:1 test results could be 1⁄2 to 1⁄3 of those reported by the lab. **GT**

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