GROWERTALKS

Columns

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Media pH: Keeping the Green in Spring

Rick Yates

Gorgeous spring flowers deserve a canopy of rich, healthy foliage to support them. Foliage color can serve as a useful indicator of overall plant health.

Several factors most commonly impact foliage color. A root system compromised by disease will quickly begin to diminish the appearance of the foliage. Nutritional imbalances also produce foliar symptoms that warrant further investigation. Maintaining the proper media pH goes a long way toward averting nutritional deficiencies and toxicities that manifest as subpar performance and appearance. Fortunately, several effective tools can be used to manage media pH.

Media pH is a dynamic system with several variables that need to be well managed in order to produce crops that meet their potential. Some of the factors that have a bearing on media pH include soilless mix components, the alkalinity of irrigation water, fertilizer inputs, limestone type and amount and, in some cases, the plants themselves. Many plants exert influence over the pH of the media in which they're grown, sometimes in a direction that seems contrary to optimum growth.

It's worth taking some time to explain why media pH plays such a big role in the nutritional well-being of the crops we produce. The availability of nutrients for uptake by plants is influenced by the pH of the media. Micronutrients—such as boron, copper, iron, manganese and zinc—become more available as the media pH declines. In soilless media, availability of these elements is good up to around pH 6.2, with declining availability as the pH increases further. Molybdenum is unique in that it becomes more available as soil pH goes up, as poinsettia growers know.

You might wonder why we don't just grow all crops except poinsettias at a low media pH to maximize the availability of micronutrients. The answer is revealed through a discussion of the relative ability of different plants to scavenge for micronutrients. Some plants are inefficient at taking up micronutrients, especially iron. Examples include some of the most popular spring flowers, such as calibrachoa, diascia, pansy, petunia, snapdragon and flowering vinca. For these crops, we generally strive to provide a media pH in the range of 5.3 to 5.8 to make the micronutrients readily available for uptake.

Another group of plants are overachievers when it comes to taking up micronutrients. Examples include geraniums (seed and zonal), helichrysum, New Guinea impatiens, lisianthus, African marigolds and pentas. If

these crops were to be grown at a pH of 5.3 to 5.8, they may well accumulate toxic levels of micronutrients. Most of these crops thrive at a media pH between
6.0 to 6.6.

Now that the importance of media pH has been established, the next step is to consider how best to keep it in the correct range for each crop. Most growers produce a variety of plants with varying pH requirements in the same growing area. Success has been achieved growing low-pH crops (5.3 to 5.8) with those that aren't as particular, targeting a middle ground (pH of 5.7 to 6.2). Whenever possible, segregate crops that need a higher media pH (6.0 to 6.6) and grow them together. Varying temperature and light requirements may not always allow that to happen, so do the best that you can.

So-called high-lime soilless mixes may be an option when high-pH crops can't be segregated. These mixes receive a higher lime charge with the idea that the high-pH crops can be fertilized along with the lower-pH crops while maintaining a satisfactorily high pH.

Another option is to simply fertilize the crops differently according to their needs. The GGSPro team creates fertilizer programs for growers based on the alkalinity of their irrigation water and the pH requirements of their crops, allowing fertilizer rotations to aid in managing crops with different pH requirements. Check with your supplier about similar resources.

The ability to monitor media pH is essential for optimizing crop nutrition. Many reputable labs can assist you with a full report of the nutritional status of the media. These tests are quite valuable, especially for troubleshooting. You can also monitor the pH and EC with simple in-house testing. (See the sidebar for thorough instructions for the 2:1 and pour-thru media testing techniques.) In-house testing allows for more frequent and cost-effective monitoring between lab tests.

When testing indicates the pH has moved out of the ideal range, steps can be taken to correct it. Raising the media pH can be accomplished through various means, each with its own merits. Media drenches of potassium bicarbonate, flowable calcium carbonate (CalOx) and flowable dolomitic limestone (Limestone-F) all have a place. Again, the sidebar offers specific information on how to utilize these tools. When the media pH needs to be decreased, often the best option is to inject reagent-grade sulfuric acid. Depending on how far the pH needs to be reduced, inject 1 to 1.5 oz. per 100 gal. and monitor media pH, stopping the acid injection as soon as the target range is achieved. If sulfuric acid is already being injected to counteract excess alkalinity in the irrigation water, increase the acid amount by 25% to 33% and re-check the media pH after three to four irrigations. Iron sulfate and aluminum sulfate drenches are other options, depending on the crop(s) involved. Controlled-release prills of aluminum sulfate are sometimes used for hydrangeas and certain nursery crops.

With a little coaching, regular media pH testing can be a part of your crop health-monitoring process. Add this to the benefits of scouting for insects, mites and diseases, and you can be well on your way to providing the preventative care that reduces the risk of unpleasant surprises, improves plant quality and reduces shrink.

More Tips on Media pH

> **Collecting media samples**

Sampling methods vary slightly by test method. As with all aspects of testing, random sampling and consistency of method contribute greatly to the reliability of the resulting data. Sampling should occur in a random manner and should include samples from across the majority of the crop. Fertilizer prills should be screened out of media prior to testing.

SME and 2:1 Sampling Method—Preferred Method
1. Remove the pot from the plant, leaving the root mass and associated media as intact as possible.
2. Collect several tablespoons of media from a point near the center of the pot.

> • Find a point about halfway down soil mass.
> • From this spot, pinch towards the center of the pot to collect the media sample.

3. Collect samples from five to 10 pots selected randomly from as much of the crop as possible.
4. Combined volume of ½ cup is adequate for in-house 2:1 testing. Consult sample submission guidelines for laboratory testing, as a larger volume may be requested.

SME and 2:1 Sampling Method—Alternate Method
1. Collect a core sample from the pot.
2. Retain the middle 50% of the sample (discard the top and bottom 25%).
3. Continue with Steps 3 and 4 from Preferred Method.

Pour-Thru Sampling Method
1. Sampling involves collection of leachate from pots.

Testing media pH and EC with the 2:1 media test
Materials needed
* Distilled water
* Two 2-cup glasses or plastic measuring cups (Pyrex with markings work well)
* pH and EC meter(s)
* Media sample(s)

Test procedure
1. Rinse container with distilled water.
2. Measure ½ 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, but do not exceed four hours.
6. Use meters to test pH and EC of the liquid layer above the settled media.
7. Rinse container thoroughly before storing or processing the next sample.

Testing media pH and EC with the pour-thru technique
Materials needed

* Distilled water
* Graduated cylinder or small volume measuring cup
* Plastic saucers
* Plastic sample cups
* pH and EC meter(s)
* Crop to be tested

Test procedure

1. Irrigate crop (or sample pots only) to saturation following normal irrigation practices, i.e., use fertilizer if using a constant feed program.
2. Select five representative (random) pots from the crop for sampling.
3. Allow pots to drain for 30 to 60 minutes (be consistent across sampling events).
4. Rinse plastic saucers with distilled water, shake excess water from saucers.
5. Place saucers under pots, one pot or cell pack per saucer.
6. Add distilled water to the container in sufficient volume to collect 1.7 oz. (50 mL) leachate from the pot. Trial and error will help to identify the best volume for your mix. Expect to add increasing volumes of distilled water for larger pot sizes. A good starting point for 6.5-in. azalea pots is 100 mL of distilled water. Keep in mind that leachate volumes above 60 mL will be too diluted to provide reliable data.
7. Use meters to test pH and EC of the leachate from each pot.
8. Average the results from all five containers.
9. Rinse all containers and saucers thoroughly before storing or processing the next sample.

Rapid corrective measures for media pH

On occasion, media test results will reveal an extreme problem with media pH that requires immediate correction. It's critical to crop health and salability to correct the pH as quickly as possible. The following methods to achieve the correction are proven safe and effective.

Raising media pH in a production environment: When media pH falls below the desired range, swift, effective correction is desired to avoid crop problems. Fortunately, three inexpensive products are readily available and appropriate for both greenhouse and nursery media: flowable limestone, flowable calcium carbonate and potassium bicarbonate. All three offer proven performance, providing fast acting increases in media pH.

Flowable limestone, sold as Limestone-F, will raise media pH and hold it at the new level for a longer period of time compared to potassium bicarbonate. However, because the solution is quite thick, flowable limestone is more difficult to apply. While it can be applied using an injector, it's abrasive and may cause premature failure of wear-related components. Some growers prefer to use a simple siphon system, such as a Hozon. Treatment with Limestone-F also contributes significant amounts of calcium and magnesium to the media. These added nutrients may prove beneficial to the crop and are seldom harmful.

Potassium bicarbonate injects easily, leaves no residue, but offers a shorter-term solution compared to flowable limestone. Large amounts of potassium are applied as a result of this treatment and higher rates can distort the foliage of some plants. Leaching with a balanced feed at the next irrigation helps to overcome the imbalance.

Flowable calcium carbonate, available as CalOx, is easier on injectors than flowable limestone.

However, in low flow-rate drip systems, the CalOx may be deposited on the inside of irrigation pipes; hand watering is preferred in this scenario. In addition to pH adjustment, CalOx does provide calcium to the soil.

Specific grower needs guide the decision regarding which of the three products to use. When utilizing re-circulated water, flood irrigation, low-volume drippers prone to clogging or when visible residue would be a problem, treatment with potassium bicarbonate is the preferred choice. When producing longer-term crops, flowable limestone or flowable calcium carbonate are preferred. Regardless of the product used, the following points should be kept in mind for flowable limestone, flowable calcium carbonate and potassium bicarbonate:

- Most of the pH change will occur within 24 hours of treatment, with a slight increase occurring in the next seven days.
- Media pH should be re-tested seven days after treatment; reapply treatment as necessary until desired pH is reached.
- All three products should be applied to leach for maximum pH rise.
- Avoid applying these products to dry media.
- Foliage should always be rinsed prior to any residue drying on the leaf surface.
- Always flush injectors following treatment.

Top dressing of pelletized or granular limestone products is generally not an effective method of increasing media pH in a timely manner. This can bring less predictable results and involves more complicated application rates. Special cases may warrant top dressing; contact your supplier for help in evaluating this need. **GT**