

Tech Shares

Managing pH Issues

Benchrunner Article August 2018

Fred Hulme Ph.D., Technical Services, ICL Specialty Fertilizer

Why do we care about root zone pH?

pH is a measurement of root zone hydrogen ion concentration and is a major concern in container production. pH influences essential element availability (e.g. iron or manganese) and an excess or deficiency of these nutrients can dramatically affect crop quality. At high pH's (> 6.5), the solubility of some micronutrients is restricted and deficiency symptoms can develop in some crop types (e.g. petunias, ornamental grasses, roses are good indicator crops). Conversely, when root zone pH's are too low (< 5.5), some micronutrients are more soluble and can cause toxicities in some crop types (e.g. geraniums, marigolds, New Guinea impatiens).

How do you keep root zone pH's in acceptable ranges?

Typically growers strive to maintain growing media pH's between 5.5 and 6.5—this is a sweet spot where nutrient availability is optimized. However, there are a number of growing system factors that impact root zone pH:

- Irrigation Water Quality – the total alkalinity (or bicarbonate level) provides much of the pH buffering in the container during the crop cycle. Think of alkalinity as dissolved lime that is applied each time the plant is watered. Ideally, irrigation water should run 50 to 120 ppm total alkalinity.
 - If alkalinity is too low, root zone pH can drop over time because acidic influences from fertilizer build up.
 - If it is too high, root zone pH can rise as excess bicarbonates build up. This is especially a problem with highly alkaline waters (above 150 ppm) where some sort of acidification may be needed to adjust the water.
- Growing media components (e.g. sphagnum peat moss and green bark) can have very low pH's. Starting mix pH can be adjusted upwards by adding limestone. Depending on the type and rate of limestone used, remember that liming is a temporary fix. Not enough lime will result in low starting pH's and excess lime will create high pH issues. Limestone will be leached and neutralized over time which will remove it as a factor, especially with long term crop cycles.
- Fertilizers can be acidic, neutral or basic in nature depending on the raw materials used to make a specific formulation. Typically fertilizers that are high in % ammoniacal and urea N are acidic in nature and fertilizers higher in % nitrate N are neutral or basic in nature. It is critical to match fertilizer to water chemistry and growing media to keep things in balance and to avoid pH swings. Your fertilizer company expert should be able to help you select a fertilizer program systematically.

What can you do if root zone pH's drop too low?

It is always best to avoid low pH's, but this sometimes occurs due to media issues or improper fertilizer choice/ application—remember that pH is a logarithmic value: a pH of 4.0 is 100 times more acidic than a pH of 6.0. Once a crop pH falls to 4.0, there is a lot of heavy lifting to be done to raise it back up. While low pH's are hard to completely mitigate quickly, there are steps a grower can take:

- Using higher % nitrate N fertilizers (with potential basicity values) will trend root zone pH's upwards but can be a slow and gradual process.
- Adding buffering to the irrigation water via injecting potassium bicarbonates, applying liquid lime stone or even topdressing plants with lime. These practices can help, but may not completely solve the problem.
- If pH's are too low, you can switch to fertilizers with lower micronutrient %'s to minimize buildup of iron/ manganese in the tissue of sensitive crops.

What can you do if root zone pH's rise too high?

Typically, this happens with high alkaline water or when too much lime is added to the growing media. High pH's can be mitigated with these steps:

- Using higher % ammoniacal or urea N fertilizers (with high potential acidity values) like Peters Excel® pHlow® 21-7-7 Acid Hammer will push root zone pH's down.
- Injecting acids (e.g. nitric, sulfuric and citric) into the irrigation line will reduce media pH. The key point here is to constantly monitor pH as you are treating and to not overshoot the mark which can lead to excessively low root zone pH's.
- Treat the symptoms. Since high pH will restrict availability of iron/ manganese, change to products with higher micronutrient content or switch to fertilizers containing chelates that are more efficient at higher root zone pH's (e.g. Peters Professional® black iron products that provide iron at extremely high pH's). You can also green up chlorotic plants by supplementing with foliar sprays or drenches of micronutrients (e.g. Peters Professional Liquid STEM™ or iron chelates).

