e-GRO Alert

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Summer Weather Patterns Can Influence Water Quality

High temperatures and drought can influence the quality of the irrigation water coming from your well. When rainfall is scarce more pressure is exerted on the aquifer that surrounds your greenhouse operation. As some of these aquifers are stressed, water alkalinity levels may increase as more water is drawn from the aquifer.

My operational area in Pennsylvania is primarily underlain by limestone. Irrigation water drawn from these wells will have an average pH of 7.2 with total alkalinity levels that range between 150 to 300 ppm calcium carbonate. Acid injection is required in almost every greenhouse operation in this area unless the operations are focused on crops that require a higher media pH like geraniums or African marigolds.

Water quality is the unseen and forgotten variable when managing plant nutrition in the greenhouse or field. Growers cannot visually see changes in their water so they may take it for granted. If irrigation water quality is ignored crop quality and production issues may be observed.

One greenhouse operation in my coverage area has battled water quality issues for the past several years. In January 2019 they had their irrigation water tested by an accredited lab to determine the EC (Electrical Conductivity), the total alkalinity level, the pH of the water, the sodium chloride levels, and the SAR ratio of the water source. The grower used the web-based program, AlkCalc, which can be found in the mobile web apps section on the e-Gro Website at: http://www.e-gro.org/ to determine the precise amount of sulfuric acid that must be injected into the irrigation water to reduce the pH and

alkalinity level of the water being supplied to the crops.

This grower had previously purchased a range of meters and testing equipment that could be utilized onsite to monitor their water quality during the growing season. Unfortunately, the testing equipment was never utilized and had fallen into a state of disrepair and could not be trusted to provide accurate results if deployed. Ideally this grower should have set up an in-house testing program where they would check the pH, EC, and total alkalinity levels of their irrigation water prior to refilling their stock tank containing fertilizer each week. If the grower just monitored their irrigation water quality for three key parameters (pH, EC and total alkalinity) the grower would know immediately what modifications may be needed in their acid injection and/or fertility program.

As a point of reference, water samples submitted by the grower to an accredited lab revealed that the irrigation water had a pH of 7.2, an EC of .85 mS, and a total alkalinity level of 300 ppm calcium carbonate. The grower used the AlkCalc program to input the pH and total alkalinity data to determine the precise amount of 96% sulfuric acid to add to their stock tank to reduce their outgoing irrigation water pH to 6.0.

A few short months after starting an acid injection program this grower contacted me because they were beginning to see interveinal chlorosis appearing on the new growth of their garden mums. The grower indicated that “nothing “ had changed and that the fertilizer injector appeared to be working properly. As soon as I arrived on site, I first calibrated my multiparameter pH and EC meter using fresh calibration solutions. Then I pulled a water sample

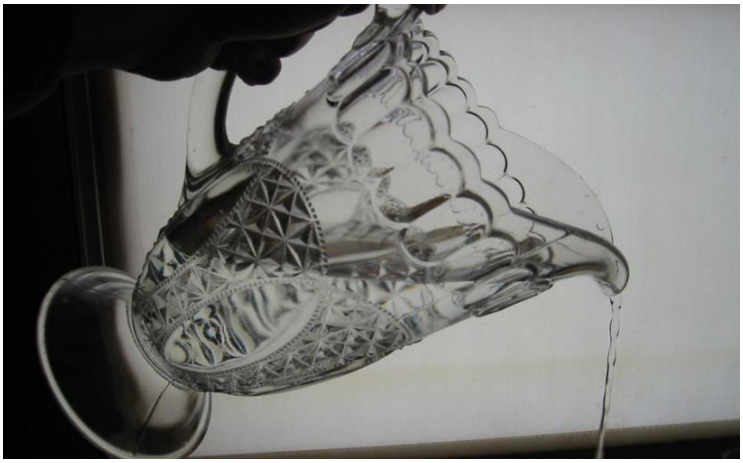

Figure 1: Changes in water quality are not usually detected by visual inspection. Photo by Tom Ford, Penn State Extension.

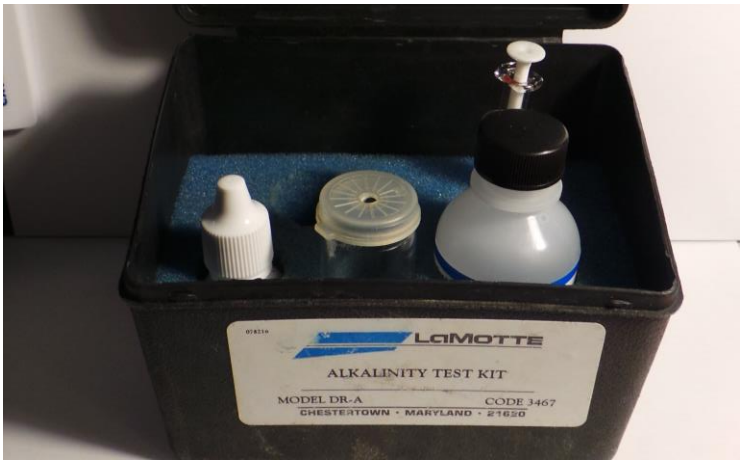

Figure 2: Alkalinity test kits have a greater testing range than alkalinity test strips and are the preferred choice for growers monitoring water quality in areas underlain by limestone. (Photo by Tom Ford, Penn State Extension).

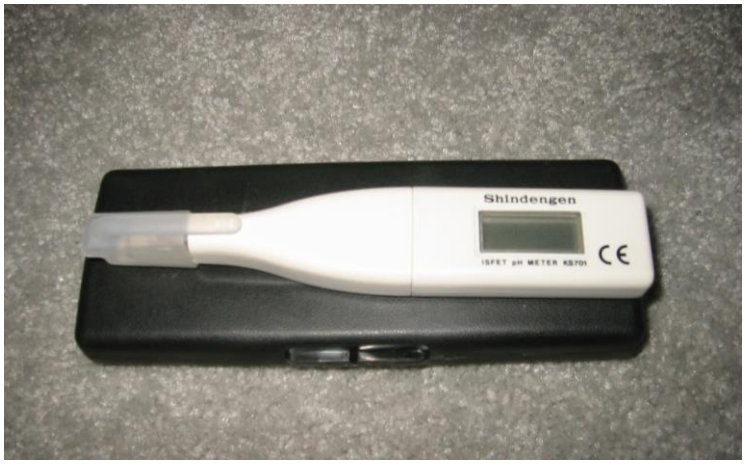

Figure 3: A high quality pH meter can be used to monitor water pH before and after acid injection. (Photo by Tom Ford, Penn State Extension).

Figure 4: Interveinal chlorosis on new growth is an early indicator that media pH is drifting upwards. If this symptom is observed, it may mean that your water quality has changed. (Photo by Tom Ford, Penn State Extension).

Figure 5; Seasonal changes in water quality may be linked to rainfall or be influenced by the demand placed on an aquifer by residential users or commercial businesses. (Photo by Tom Ford, Penn State Extension).

directly from an outlet or hydrant that was not connected to the fertilizer injector system and split the sample into two samples. With the calibrated meter I checked the water pH and EC of the first sample. I then took a small amount of water from the second sample and added it to the bottle in my water alkalinity test kit. I added two drops of a reagent and then filled my titrator with acid from the kit. Holding the sample aloft and up to the light a bit, I titrated one drop at a time into the bottle. I emptied the titrator (200 ppm) and then refilled the titrator with more acid and began the titration process again. I emptied the entire titrator one more time and began to see a little color change as I reached what would be the 400-ppm calcium carbonate level. I refilled the titrator a third time and titrated an additional 25 ppm to reach the endpoint. To verify the accuracy of my readings, I pulled another water sample, measured the water pH, EC, and performed another titration. In both cases the water pH was 7.4, the EC was .95 mS with a total alkalinity of 425 ppm.

With the rise in the total alkalinity level of the irrigation water confirmed the grower was instructed to increase the amount of sulfuric acid that they were injecting into the irrigation water prescriptively. Within days of this slight adjustment in the sulfuric acid injection rate the interveinal chlorosis in the garden mum crop diminished and overall crop quality improved.

Water quality can be greatly influenced by a variety of environmental factors. Growers should routinely check the pH, EC, and total alkalinity of their water source(s) to prevent cropping issues linked to water quality. For additional information please contact the author at tgf2@psu.edu .

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