Trending at Ball Seed

Dec 12, 2025

Water Quality & Fertilizer Food for Thought (Part 1)

Technical Services

In late November, we wrote about a bunch of water-quality concepts, irrigation water testing, macro and micronutrients, and so on. Apparently, that sparked a fire in many of you, because Nick Flax received a LOT of conversations from you about water quality management and fertilizer since then!

PROBLEM: What's the deal with my water?

NICK'S TIP: There have been some common themes in these conversations that we haven't written about in the past, so we'll take the next couple of weeks to provide some add-ons to the discussion.

In WEEK 47, we broke down alkalinity — the core concepts, tools to calculate acid, and general management when alkalinity is high. What we didn't touch on was how to implement acid injection into your operation. If your raw water's total alkalinity level is less than about 250 ppm $CaCO_3$, there are a few ways you can incorporate acid into your irrigation/fertigation strategy. However, there are pros and cons to each method, so we will call out a few for each acidification approach:

1. Dedicated acid injection plumbed into your main irrigation line(s). This is exactly what it sounds like: install an acid injector immediately downstream of where your water source enters the greenhouse.

Pros:

- Allows you to reduce alkalinity in both clear water irrigations and fertilizer applications to keep substrate pH from creeping up regardless of whether crops are being fed or watered. In turn, this enables you to switch between nitrate- and ammonium-based fertilizers with less concern for the long-term impact on substrate pH, and steer crop growth more easily simply by switching fertilizer formulations.
- Simplifies adjustments to your acid proportioner if your water's alkalinity changes significantly throughout the year if the system is only in one place (per range/water main).
- Reduces monitoring and maintenance burden year over year. Fewer injectors mean fewer potential failure points.

Cons:

- Maximum flow rate/peak demand in the greenhouse can become a limiting factor depending on your greenhouse size. The bigger your operation, the larger or more extensive your acid injection system needs to be to supply acidified water at workable pressure on your highest-demand days. In general, the bigger the injector, the more expensive it will likely be.
- Increases the number of crops that could be adversely affected if you have a single injector/system that services many greenhouses and a failure or malfunction occurs. Ensure that you have some form of redundancy or the ability to make repairs quickly to reduce risk.

2. "Paired" acid injectors for each greenhouse's fertilizer injector. Rather than have one large acid injector for multiple houses, pair a dedicated acid injector with fertilizer injector/injector manifold in each greenhouse. Be sure to plumb in a bypass that allows you to make clear water irrigations with acidified water, too.

Pros:

- Also allows you to apply fertilizer and irrigate with alkalinity-adjusted clear water every time, and switch fertilizers to steer crop growth and development.
- Facilitates multiple acid injection schemes for different production areas. For example, acid injection can be reduced to accommodate high pH-loving crops (ex. geraniums and marigolds) in one area without pushing substrate pH up for acid-loving crops (ex. petunias and pansies) in another greenhouse/section.
- Reduces risk associated with possible failure of a single, centralized acid injection system.

Cons:

- Incurs additional cost to buy, install and maintain multiple acid injectors throughout your operation.
- Increases the chance for possible mixing errors if clear protocols aren't established for each range or production area

3. Forego separate acid injectors and just add acid to your fertilizer stock solution. This is not ideal, but it is an easy way to combat the effects of alkalinity on substrate pH over time with minimal cost.

Pros:

- Allows you to address alkalinity levels whenever you apply fertilizer but not when making clear water irrigations.

If you adopt a constant liquid feed approach rather than alternating between fertilizer and clear water, this will increase the impact of adding acid.

- Eliminates the need to purchase, install, and maintain additional injectors.

Cons:

- Limits how much acid you can add, depending on your alkalinity level and fertilizer stock solution concentration.

Higher alkalinity requires greater amounts of acid to neutralize. Mixing high concentrations of acid into concentrated fertilizer stock can quickly cause nutrients to precipitate/fall out of solution and turn into sludge in the bottom of your stock tank.

If your injection ratio is between 1:50 and 1:100, you can generally add acid to your fertilizer stock solution with few incompatibility issues. However, adding acid to stock mixed for higher injection ratios like 1:200 increases the odds of incompatibility concerns.

- Increases safety concerns with handling acid and strong chemical reactions if done incorrectly.

Avoid adding concentrated acid to fertilizer stock solution as much as possible and add acid to your stock bucket/tank first, before adding water-soluble fertilizer.

To minimize severe chemical reactions and reduce the risk of salts precipitating out of solution:

1. Fill your stock solution container with at least ~1/2 to 3/4 of the clear water needed for the total volume you plan to mix,
2. Slowly add your acid while gently mixing the water until it is all mixed into the stock solution,
3. Slowly incorporate your water-soluble fertilizer powder a bit at a time while mixing/agitating until it is all added,
4. Top it off with water to hit your final volume and mix thoroughly.

Next week**, we'll dig into how to address a few common nutrient imbalances and oddball water quality concerns.**
