GROWERTALKS

Features

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Wondering About Your Water?

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Water testing is one of the industry's most underutilized tools for managing crop nutrition. Services offered by a horticultural water testing lab will include measuring pH, alkalinity and EC (electrical conductivity or soluble salts), as well as levels of macro and micronutrients that are relevant to plant production. Understanding the impact of these key analytes allows growers to create precise nutrition plans and avoid undue damage to sensitive crops.

Figure 1: Soluble salt damage on pansy due to high EC buildup in the growing media.

The basics

Irrigation water generally comes from three sources:

■ Pond water, which may also be a catch pond to reclaim irrigation water, can vary drastically in nutrient content due to its exposure to fertilizer runoff, rain events and evaporation over time.

■ Well water is perhaps the most common source of irrigation water and can vary greatly between different regions or even locally.

■ Municipal water, or "city water," is treated to preserve the infrastructure of the pipes that distribute it. This treatment results in less seasonal variation in water quality, although utilizing this source incurs an additional cost for the grower.

A pH reading is a measurement of the acidity or basicity of a solution. In general, water for irrigation should have a pH between 5.0 and 7.0. Water with pH below 7.0 is acidic and water with pH above 7.0 is basic. Water with a pH 7.0 is neutral. Knowing the pH of the water is important because it generally gives us an idea of what else might be in your water.

For hydroponic producers, solution pH equates to root zone pH; however, solution pH has very little impact on substrate pH in field or container production. When growing in peat or pine bark-based media, alkalinity is the primary driver for
soil pH change.

Alkalinity is a measure of the dissolved bicarbonates (i.e., calcium, magnesium and sodium-based) in water. These bicarbonates all create a basic reaction in the substrate and predict what your water will do to media pH over time. The higher the alkalinity the greater the upward pressure on media pH. If excess alkalinity isn't accounted for it causes a gradual "liming of the media." Very low alkalinity water doesn't buffer or resist the pH change that many fertilizers create. This can lead to plummeting media pH if heavy acid-forming fertilizers are used extensively (e.g., 20-10-20).

Table 1: Common rotational fertilizer choices

Type A	Type B
All-purpose fertilizers (acid reaction)	**Calcium-based fertilizers (basic reaction)**
21-5-20	15-0-15
20-10-20	12-4-16
20-3-19	13-2-13
19-2-19	15-5-15

Table 2: Spring crop pH preferences

Low pH	High pH
pH = 5.3 to 5.8	**pH = 6.0 to 6.5**
Ivy geranium, petunia, calibrachoa, pansy, vinca	Seed and zonal geranium, New Guinea impatiens, African marigold, lisianthus, penta, lily

Table 3: Products for managing pH problems

Raising pH	Lowering pH	Nutritional Deficiencies
CalOx pH	Sulfuric Acid	Calcium Chloride Dihydrate
Potassium Bicarbonate	Citric Acid	Epsom Salts
	Nitric Acid	Plantex Iron DTPA & EDDHA
	Phosphoric Acid	S.T.E.M. & M.O.S.T.

Electrical conductivity (EC) is a measure of dissolved salts. The EC of water applied to the crop must be known to balance adequate nutrition while avoiding high soluble salt levels in the media. The goal is to provide adequate nutrition to the crop while avoiding excessive fertilizer applications and accumulation of salts in the substrate that can cause stunted growth or foliar and root damage (Figure 1). A water source with high starting EC levels presents problems because this water can limit the amount of fertilizer that can be applied. Knowing the starting water EC allows us to correctly calculate the fertilizer rate used to feed the crop.

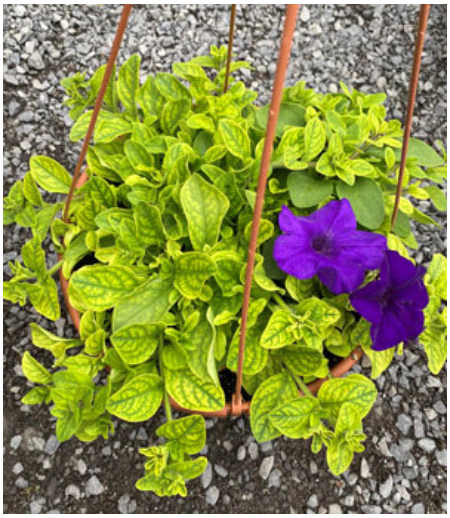
After you test, come up with a plan

Once we understand these key measures of water quality, we can craft a fertilization plan that optimizes our plant nutrition strategy while reducing potential problems. The GGSPro general fertilizer programs correlate to broad alkalinity ranges and are further optimized for crops preferring low or high media pH. Media pH can generally be managed through fertilizer selection when water alkalinity is less than 150 ppm $CaCO_3$. For water with alkalinity greater than 150 ppm $CaCO_3$, acid injection is recommended.

The GGSPro general fertilizer programs rely on a rotational approach to balance media pH while providing an adequate assortment of nutrients to encourage optimum growth. Each program will call for a rotation between an acid-forming fertilizer (Type A) and a calcium-based formulation, which provides a basic reaction (Type B; see Table 1).

Griffin Greenhouse Supplies represents many partners that manufacture water-soluble fertilizers. Exact selection of Type A and Type B fertilizers is determined by grower preference/needs. Often, Epsom salts (magnesium sulfate) may be added to formulations in the Type A group, but shouldn't be added to calcium-containing fertilizers (Type B group) when using concentrated stock tanks.

Two subcategories of each fertilizer program address optimal crop pH needs. Crops not listed are less sensitive to media pH and are often grown under either pH strategy (see Table 2). Please note: Your specific production scheme may not allow for fertilizer rotation to feasibly be maintained—there are many strategies available to help manage pH and overall plant nutrition. Work with a technical professional to find the right approach for your situation.



Despite using pH-adjusted growing media and best practices, there are times when soil pH falls below or rises too high for optimum crop production. Irrigation water quality, fertilizer selection and even the crop itself can cause significant changes to the pH. Substrate pH affects the availability of micronutrients to the crops we produce. At high pH, the majority of our micronutrients (e.g., iron, manganese, zinc and boron) become less plant available (Figure 2).

Figure 2: Iron deficiency on petunia due to high substrate pH caused by high alkalinity irrigation water.

Conversely, at low pH, these can become excessively available. Griffin Greenhouse Supplies offers a variety of products that help manage substrate pH or the symptoms caused by suboptimal substrate pH as shown in Table 3. For more information and a list of labs offering appropriate water testing services, contact GGSPro. GGSPro can also assist in interpreting water test results and developing a fertilizer program tailored to your specific crop needs. **GT**

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