

Acid Choices for Reducing Water Alkalinity

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Some water sources cause the pH of a growing medium to rise rapidly over time. This has nothing to do with the pH of the water, but rather with the alkalinity in the water. Alkalinity is a measure of the bicarbonates and carbonates in the water. Another way to understand water alkalinity is that it is a measure of the “limestone” content in the water. The higher the alkalinity, the more “limestone” that is being applied, causing the pH of the growing medium to climb. To offset this pH rise, acids are injected into the irrigation water to neutralize some of the alkalinity and reduce the “limestone” content in the water. Here are some important tips to consider when choosing an acid.

Selecting an Acid

When deciding which acid to use, there are several factors to consider including safety, additional plant nutrients provided, cost, and availability. The most common acids used to reduce water alkalinity include sulfuric, nitric, phosphoric and citric acids. For these 4 acids: see how much is

required to drop the alkalinity of the water by 50 ppm CaCO₃, the nutrients provided, relative safety, and cost (Table 1).

Acid	% Active ingredient	Fl. ounces/100 gallons water to neutralize 50 ppm alkalinity	ppm element supplied	Relative safety*	Cost**
Citric Acid (H ₃ C ₆ H ₅ O ₇)	50%	1.78 oz.	None	1	\$\$\$
Nitric Acid (H ₂ NO ₃)	67%	0.87 oz.	14.3 ppm N	5	\$\$
Phosphoric Acid (H ₃ PO ₄)	75%	0.94 oz.	27.5 ppm P	3	\$\$
Sulfuric Acid (H ₂ SO ₄)	35%	1.42 oz.	16.1 ppm S	3	\$

Table 1. *Relative safety: 1 = fairly safe; 5 = very dangerous **Cost: \$ = least expensive; \$\$\$ = most expensive

Nutrients Provided by Acid

Table 1 shows the parts per million (ppm) of the element supplied by each acid. Citric acid does not provide any significant levels of elements. Nitric and phosphoric acids provide needed plant nutrients that are often provided solely by fertilizers. When using a higher rate of an acid, it can provide a significant level of a plant nutrient as seen in Table 1, so a fertilizer with a lower ratio of this element may need to be used.

In the case of nitric acid, this may mean reducing the application rate of an existing fertilizer. If this does not work, then use a fertilizer with a lower ratio of nitrogen to potassium, such as 15-2-20, 15-5-25, 17-5-24, 20-5-30, etc. Remember that using a new fertilizer may have a different influence on the pH of the growing medium.

When using phosphoric acid, higher rates can provide more phosphorus than crops require. Most crops only need 20 ppm P (45 ppm P₂O₅), so if enough acid is injected to reduce alkalinity by 50 ppm CaCO₃, then too much phosphorus is applied at 27.5 ppm. Extra phosphorus will not harm the crop, but it can lead to stretching and softer growth. If phosphoric acid is used, consider using a fertilizer with no phosphorus, such as 17-0-17, 20-0-20, 25-0-25, etc.

Sulfuric acid provides sulfur in the form of sulfate, which is needed by plants and is often low in water sources and fertilizer programs. Therefore, high rates of sulfuric acid do not cause any issues with the crops as the normal recommended range for sulfur (sulfate) is 25-60 ppm sulfur (75-180 ppm sulfate). For these reasons, and the fact that it is typically the least expensive, sulfuric acid is the choice of most growers.

Tips on Mixing Acid

It is best to inject acid directly from a concentrate barrel into the irrigation line so there is no handling. This is the safest option. If acid must be diluted with water first before injecting, remember to add acid to water, and not water to acid as it will cause dangerous reactions. Although these acids are liquids, they are heavier than water and will settle at the bottom of the tank, so it must be stirred to dissolve into the water. Remember acid is caustic to metal parts, so consult your fertilizer injector manufacturer to make sure your injector is compatible for injecting acid.



Acid is being directly injected from these two acid tanks into the irrigation water. This is safer than having to mix it with water. Source: Premier Tech.

Concentrated acid could be added directly to the stock solution of some fertilizers, but not all. Sulfuric or phosphoric acids cannot be added to the stock solution of a calcium-based fertilizer, as precipitates of calcium sulfate or calcium phosphate, respectively, will form. However, a little

acid can be added to a fertilizer stock solution to drop the pH of the water to help the fertilizer to dissolve. Often, citric acid is used for this purpose since it does not provide nutrients that can form precipitates.

Acid Safety

Citric acid is the safest of the acids to use, followed by sulfuric and phosphoric. Keep in mind the more concentrated the acid (higher percentage of active ingredient), the more caustic and dangerous it will be. With any of these acids, avoid contact with the skin or eyes as it can cause irritation or even minor burns. These acids can damage clothing by forming holes after clothing is washed. Nitric acid is much more caustic and will burn skin or eyes. It can also produce hazardous fumes that should not be breathed in. When working with any acid, it is best to wear safety glasses, a face shield, acid resistant gloves, and an apron.

Note: Since Premier Tech does not manufacture acidifiers, we invite you to consult your manufacturer for specific information concerning the use of their products.

For more information, contact your Premier Tech Grower Services Representative:
<https://www.pthorticulture.com/en/grower-services/>