GROWER SERVICES Tips

Laboratory Analysis. Grower Tools. Educational Support.

ACID INJECTION: BENEFITS AND PRECAUTIONS

Injecting acid into a water source is needed to neutralize excess alkalinity and thereby prevent the pH of the growing medium from rising to unacceptable levels. Acid injection may not be needed in all cases as fertilizer can help, but when fertilizer is not sufficient to counteract the pH increasing influence of water alkalinity, injecting acid will do the job.

Using Fertilizer to Control Growing Medium pH: Some sources may indicate that acid should be injected if water alkalinity exceeds 120 ppm $CaCO_3$. In the case of young plant production this is true. For more mature plants it will work, but adjusting your fertilizer's potential acidity will eliminate the need to inject acid. For example, if a grower only uses a potentially basic fertilizer, such as 14-0-14, 13-2-13, 15-5-15, etc., then acid injection will be needed at alkalinities above 120 ppm $CaCO_3$. However, if the grower uses a fertilizer with a potential acidity of 200-400 lbs calcium carbonate equivalent the plants roots will use the fertilizer to generate sufficient acid to neutralize the alkalinity. In the table below, notice that simply adjusting the fertilizer will offset the effects of water alkalinity at levels up to 250 ppm $CaCO_3$.

Water Alkalinity (ppm $CaCO_3$)	Fertilizer's potential acidity (PA) / Basicity (PB)*
0-80	200 (PB)-100 (PA)
80-150	200-400 (PA)
150-250	400-600 (PA)
<250	Acid injection

* Program works best if fertilizer is applied as a constant feed, at recommended rates. Potential acidity is pounds calcium carbonate neutralized by a crop after used 1 ton of the fertilizer is used. Potential basicity is the pounds of calcium carbonate produced by one ton of fertilizer.

When is Acid Injection Required? The table below provides some guidelines to help a grower decide if injecting acid is required. Remember these are only suggestions and all of them must be considered. For example, if petunias and calibrachoa are exhibiting micronutrient deficiencies, this does not mean that acid needs to be injected. The problem may be fixed by selecting a different fertilizer or applying a micronutrient(s) supplement.

The other factors listed in the table revolve around the amount/frequency of water applied to the crop. Alkalinity is essentially a measure of the "limestone content" in the water, the more often the growing medium is watered, the more "limestone" that is added, causing the growing medium pH to increase. Young plants are given a substantial amount of water, so high pH is a common problem and acid is typically used if the alkalinity exceeds 100-120 ppm $CaCO_3$. Larger containers are watered less frequently so they are less likely to see rapid increases in the pH of the growing medium. Long term crops will receive more water over the course of production than short term crops, so there is more potential for the growing medium pH to rise.

IS ACID INJECTION REQUIRED?	NOT LIKELY	MAY BE NEEDED
Water alkalinity	<250 ppm $CaCO_3$	>250 ppm $CaCO_3$
Crops grown	Geraniums, marigolds, New Guinea impatiens	Calibrachoa, pansy, petunias, snapdragon, vinca
Nutritional problems seen	Iron-manganese toxicity in above crops	Micronutrient deficiencies seen in the above crops
Crop finishing time	Short term (< 4weeks)	Long term (> 8 weeks)
Container size	4 in (10cm) or larger	Plugs, young plants
Required watering frequency	Infrequent	Very frequent

Types of Acid: There are several acids that can be used to neutralize water alkalinity, but not all work the same. Except for citric acid, all acids provide nutrients that can become excessive when injecting large quantities of acid. For this reason phosphoric becomes less desirable as phosphorus levels exceeding 40 ppm can cause stretching in plants. Nitric acid provides acceptable levels of nitrogen, but is the most caustic and can produces dangerous fumes. Sulfuric acid is often the best choice since it is relatively inexpensive, has less safety risk than nitric acid and plants need a minimum of 20-40 ppm sulfur that is often missing from fertility programs and the water source. Most plants can also tolerate sulfur levels up to 100 ppm+ without any detrimental effects.

ACID TYPE	CITRIC	NITRIC	PHOSPHORIC	SULFURIC
Form	Powder / liquid	Liquid	Liquid	Liquid
Concentration	99.5 / 50%	61.4, 67%	75, 85%	35, 66, 93%
Neutralizing power	Low	Moderate	Moderate	High
Handling danger	Low	High, watch for fumes	Moderate	Moderate-high
Treatment cost	High	Moderate-high	Moderate	Moderate to low
Nutrients provided	-	Nitrate	Phosphorus	Sulfate
Reducing alkalinity by 100 ppm $CaCO_3$ provides:	-	28 ppm nitrogen	58 ppm phosphorus	32 ppm sulfur

Caution When mixing Acid

All acids are dangerous to handle, especially if they are more concentrated. It is best to protect your skin and eyes by wearing acid-resistant eye wear, gloves and apron. If acid needs to be mixed with water in a stock tank remember to ALWAYS ADD ACID TO WATER, not water to acid and do not add acid to the fertilizer stock tank. Securely cover the acid stock tank to avoid injury to employees, customers or children. Make sure the injector that is used to inject acid is acid resistant. When in doubt, contact the manufacturer and remember plastic is better as metal parts and pipes will corrode when exposed to acid.