

# GROWERTALKS

## Features

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## Factors Impacting Growing Media pH

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Whether you use pre-formulated growing media or mix your own, designing a fertilizer program that maintains the appropriate pH of the growing medium is key to proper plant growth. Factors that are essential for designing a program include the element content of the water, pH effect of the fertilizer, the crop grown, injected acids and the lime charge in the growing medium.

### **Water alkalinity**

If we look at crop inputs, water is the greatest input used in crop management and can have a profound effect on crops. Water alkalinity, a measure of the carbonate and bicarbonate levels in water, directly impacts the pH of the growing medium. Think of carbonates and bicarbonates as dissolved "limestone." The higher the water alkalinity, the more "limestone" that's applied at each irrigation, which causes the growing medium pH to climb. To counteract this pH climb coming from the water alkalinity, use a fertilizer with the appropriate potential acidity, inject acid to neutralize the alkalinity or use both.

As a side note, don't confuse water alkalinity with water pH. Water pH measures the amount of hydrogen (acid ions) in the water. The pH of the water doesn't dictate the pH of the growing medium, but in fact it's the alkalinity of the water source that influences the pH of the growing medium.

### **Water-soluble fertilizer influence**

Once water alkalinity is known, then the next step is to develop a fertilizer program that will work with your water, the growing medium and the crops grown. (More will be said on the latter two.) All water-soluble fertilizer manufacturers provide the potential acidity or basicity of their products. A fertilizer that has potential acidity may cause the pH of the growing medium to decrease over time, while a fertilizer that has potential basicity will cause the pH to increase. The higher the "potential" value, the greater the ability of the fertilizer to influence pH of the growing medium. The acidity or basicity is listed as a potential since the uptake of the fertilizer by the plant roots will determine the acid/basic reaction in the growing medium.

Water Alkalinity (ppm CaCO <sub>3</sub> )	Suggested Water-Soluble Fertilizer
Low (0-80)	Rotation of potential acid (P.A.) & basic (P.B.) fertilizers
Moderate (80-150)	Low-moderate potential acidity (100-300 P.A.)
High (150-250)	Moderate-high potential acidity (300-600 P.A.)
Excessive (> 250)	Inject acid and use suggested fertilizer for adjusted alkalinity

NOTE: These values are basic guidelines for constant feed programs applied at recommended rates. Your needs will vary based on water quality, container size and crops grown.

## Crop Influences

The plant also has some influence on the pH of the growing medium. Crops such as geraniums and marigolds are, to their detriment, efficient at dropping the pH of the growing medium. For these crops, it's best to use fertilizers with lower potential acidity or basicity to keep the growing medium pH between 5.7 and 6.2. Petunias, calibrachoa, etc. are effective at detrimentally increasing the growing medium pH, so fertilizers with higher potential acidities work better for these crops. These crops prefer the growing medium pH to be 5.4 to 5.8.

## Growing medium limestone

Generally speaking, calcitic and dolomitic limestones are used for pH adjustment of growing media. Calcitic limestone is more soluble than dolomitic and is often used for initial pH adjustment. Dolomitic limestone is less soluble and provides longer pH stabilization over the course of several weeks. Depending on the crop type, fertilizer used and the impact of acid, limestone generally doesn't last more than eight to 10 weeks in growing media. This is important for long-term crops, as once the limestone runs out, there can be larger pH swings in the growing medium.

If crop inputs cause the pH of the growing medium to rise, it still will remain high after the limestone is used up; however, if crop inputs are too acidic, the limestone won't be there so the pH of the growing medium can drop.

Limestone rates are also important. High limestone rates may require the use of fertilizers with high potential acidity to maintain proper growing medium pH, while low limestone rates may require the use of fertilizers with low potential acidity or potential basicity.

## Growing medium pH influences

The pH of the growing medium doesn't directly harm the plant; however, it influences the availability of nutrients that the plant can acquire from the growing medium. Improper growing medium pH can lead to plant chlorosis (yellowing tissue), distortion of growth or leaf necrosis (brown, dead tissue).

Macronutrients—nitrogen, phosphorus, potassium, calcium, magnesium and sulfate—are provided in large enough quantities that the pH of the growing medium has little effect on their availability to the plant.

Micronutrients—boron, copper, iron, manganese, molybdenum and zinc—are needed in much lower quantities and their availability is strongly influenced by the growing medium pH. For example, if the growing medium pH rises above 6.0, iron, manganese, zinc, copper and boron start to become insoluble and

unavailable for plant uptake. If the pH drops below 5.5, these elements become soluble and are available to the plant. Molybdenum, on the other hand, is the opposite. It becomes soluble at high pH and insoluble at low pH.

Not all micronutrient deficiencies or toxicities are pH related. Deficiencies can occur if the fertilizer application rate is too low, cloudy weather inhibits uptake of nutrients, or plant roots are diseased and cannot take up nutrients. Toxicities can occur if too much fertilizer is applied, a controlled release fertilizer releases too much or the water source provides high levels of the nutrient of concern.

### **Plant container size**

Keep in mind that a plant container is a closed system. For example, the smaller the container, the smaller the nutrient reserve for plants to access. Larger containers have a larger reserve of nutrients, so initial fertilization may not be as critical. However, if the growing medium is old, the starter charge can be used up by soil microorganisms. Whether your growing medium has a pre-plant starter fertilizer or not, or is fresh or old, it's best to begin a water-soluble fertilizer program at transplanting, even if the growing medium has a control-release fertilizer incorporated. Initial applications of half-rate solution of water-soluble fertilizer will adjust any nutrient imbalances and the fertilizer won't accumulate in the growing medium if it's watered to run through. This will help to get the plants off to a good start. As plants grow, their requirements for nutrients will increase, therefore, you'll have to increase the fertilizer application rate and/or frequency. These nutrients must be supplied by the grower for the plant to grow properly.

Putting all these factors together, a fertilizer can be selected for your crops' specific needs. Remember, not all water-soluble fertilizers are complete. Many lack calcium, magnesium and sulfate. Your water may provide these at sufficient levels or may not. Have it tested to verify, as this influences fertilizer selection. Your water may also have excessive nutrients, such as boron or other micronutrients. In this case, you may need a custom-made fertilizer that eliminates these elements from their formulations.

### **Use analytical testing**

Analytical testing is a useful tool to verify fertilizer application rates, diagnose plant nutritional disorders and avoid future crop problems. A water test is very important, not only to find out the alkalinity, but also individual nutrient levels, which influence fertilizer selection. The growing medium and tissue should be tested throughout the crop cycle to verify the pH and to see if any nutrient deficiencies/toxicities are occurring or could become a problem. This information will make it easy to verify if a fertilizer program is successfully keeping the pH of the growing medium within the desired range for the crops grown.

Fertilizer selection is an integral part of crop culture and impacts crop quality. It's best to contact your fertilizer manufacturer for assistance in selecting the fertilizer type and develop a program that's best suited for your particular needs. Some growing media manufacturers can also assist in developing a fertilizer program for the growing medium used. **GT**

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