Getting the Right Start

Knowing the nutritional requirements of your crops and planning your objectives will help you understand how fertilizer interacts with the plants and water alkalinity.

by **LANCE LAWSON & ED BLOODNICK**

Starting off on the right foot when it comes to plants means that you've prepared ahead of time to plan your crop requirements. This includes selecting the right growing medium, testing your water, designing a fertility program based on your water and doing your homework for crop cultural requirements. All of this can be a challenge, particularly if you plan to grow a crop that you may have little experience. However, with a little research, testing and planning, you can grow just about any crop successfully.

SCHEDULING

It's important to know the objectives you're trying to achieve. Some of the questions that should be answered before starting the crop include: crop temperature requirements, light requirements, container size, starting from seed or from rooted cuttings, projected crop time, and some of the problems that the crop may be prone to, such as diseases, insects and/or nutrition. You also need to determine the intended finish date. Once these have been determined, you can build a schedule for start date, including some additional time as a buffer.

SELECTING A GROWING MEDIUM

Growing medium provides four basic functions for plants—it serves as anchorage for the plant, a water reservoir, a gaseous exchange system and a nutrient exchange system for the plant root system. There are many commercially prepared growing media on the market to choose from with each product designed for a different application. There are also products available with living biological ingredients that enhance plant growth and/or suppress certain root diseases.

It's important to know the chemical and physical properties of the growing medium selected and match those to the requirements for the plants being grown. For this article, we'll touch on some of the important chemical properties, including pH and the Electrical Conductivity (E.C.) of the growing medium.

WHAT'S PH?

pH is a scale used to specify the acidity or basicity of a solution—with pH 7.0 being neutral, below is acid and above is basic. Growing media pH is tested by extracting a solution from the growing medium. Most commercial growing media are pH adjusted with limestone to achieve a pH in the range of 5.2 to 6.2.

Unlike mineral soil, which has an ideal pH range of 6.0 to 7.0, growing media is made with a base of organic materials, such as peat moss, bark, coir and/or wood in any combination. The ideal pH range for growing media is 5.5 to 6.2, which is 0.5 to 1.0 pH units lower than mineral soil. This pH range is also ideal since most nutrients are in their most available state in soilless media.

Source: Premier Tech Horticulture.

Example of uneven growth of lettuce seedlings caused by varied irrigation and lack of fertilizer. In the upper right corner of the tray, stunted seedlings and algae formation is caused by excess moisture, while seedlings in other parts of the tray are dry and much larger in size. Overwatering can saturate growing media and leach nutrients to cause delayed plant growth. To avoid this, irrigate and apply fertilizer uniformly at regular intervals at the proper rate for seedlings.

Unlike mineral soil, growing media pH can be easily influenced and it doesn't have a high reserve of micronutrients. When pH climbs above pH 6.3, certain micronutrients—such as iron and manganese—become less available. Plants in growing media require frequent applications of fertilizer(s) to replenish macro and micro nutrients that are taken up by plants.

Note that freshly manufactured growing media can have an initial pH slightly lower than the target. This is because most products are low in moisture and the limestone hasn't had a chance to react and adjust the growing medium's pH. Once the growing medium is watered in, pH will rise and stabilize after saturation.

Most commercial growing media contain a balanced starter nutrient charge that's added to help plants adapt after planting. E.C., which measures the ability of a growing medium to carry an electrical current, is used as an indication of the amount of starter fertilizer present in the growing medium. The starting E.C. range for most commercial "general purpose" growing media is between 1.0 to 2.0 mmhos/cm. For seed germination

growing media, E.C. is generally lower in the range of 0.5 to 1.1 mmhos/cm. Most plant species, depending on their stage of development, can tolerate E.C. levels above these ranges.

WATER QUALITY

Knowing the quality of the water that's being applied to the growing media is important in getting the right start. The most important attribute is the water alkalinity, which is determined from the bicarbonates and carbonates in the water. Water alkalinity is a measure of the dissolved limestone in the water. The higher the alkalinity of the water, the more dissolved limestone it contains, and therefore, the more rapidly the water can cause the growing medium pH to rise. In cases where the alkalinity is above 300 ppm, it's often necessary to inject acid into the irrigation water to reduce the alkalinity level.

Table 1.

Starting Water pH	Water Alkalinity (ppm CaCO3)	ml Sulfuric Acid Required to Reduce Water pH to 5.0
9.3	71	1.2
8.3	310	6.0

Table 1 shows the starting pH of two water sources and the amount of acid required for each to reach a pH of 5.0. The water with the higher pH didn't require as much as acid as the one with the lower starting pH. At first glance, this may not make sense. However, note the alkalinity in the center column.

Regardless of the starting pH, the higher the alkalinity of the water source, the more acid is required to reduce pH to 5.0. For all water sources, it's the alkalinity that determines how much acid to add, not the pH. This is important for growers to know since alkalinity has significant impact on growing medium pH, choosing the correct fertilizer(s) and if acid injection is needed so that a desirable growing medium pH is maintained for the crops grown.

FERTILIZER PROGRAM

Getting the right start is knowing the nutritional requirements of the crops grown and how the fertilizer selected interacts with the plant and water alkalinity. This is necessary to provide crops with the correct nutrient level and help manage the pH and E.C. of the growing medium. As stated above, the higher the alkalinity of your water source, the faster the pH of the growing medium will rise. This pH rise can be offset by using a potentially acidic fertilizer at the correct rates.

If the alkalinity of the water source is a moderate 60 to 120 ppm, then use a fertilizer with a low potential acidity below 200 lbs. of calcium carbonate. If alkalinity is below <60 ppm, a potentially basic fertilizer may be needed to maintain or increase growing medium pH (Table 2). When alkalinity is low, potentially acidic and potentially basic fertilizers can be alternately applied to achieve the desired growing media pH. (Note that most fertilizers indicate whether they're potential acidic or basic, which is listed in pounds of Calcium carbonate equivalent per ton.)

Fertilizer	Analysis	Potential Acidity (PA)	Potential Basicity (PB)	NO_3	NH_4	Urea
Acid Special	21-7-7	1556		0	44	56
Petunia Fert.	20-3-19	420		60	40	0
General Purpose	20-10-20	397		61	39	0
High Mag	18-8-17	381		60	40	0
General Purpose	15-16-17	196		54	20	26
Cal-Mag	17-3-17		27	76	24	0
Pansy Fert.	15-2-20		168	83	17	0
Plug Fert.	13-2-13		200	89	11	0
Dark Weather Fert.	15-0-15		344	90	10	0

Source: Premier Tech Horticulture.

Table 2. Comparison of popular water-soluble fertilizers. Fertilizers with higher rates of ammoniacal form of nitrogen (NH_4) and urea are PA compared to fertilizers with higher ratios of nitrate (NO_3) are PB. Fertilizers with PA are used to decrease growing medium pH and fertilizers with PB are used to raise growing medium pH, depending on the applicate rate and the water alkalinity content. Alternate applications of PA and PB fertilizers can be used to maintain growing medium pH in an ideal range of 5.5 to 6.2.

To get the right start, it means that you're attentive to details and know the requirements of the crops you'll be growing—test your water, know your fertilizer type, schedule your crops and select the right growing medium for your application. Keep good notes and follow your crop schedule to be successful and produce quality crops.

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