GROWERTALKS

Columns

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Micronutrients: They’re Bigger Than You Think

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Micronutrients, by definition, are required by plants in small quantities, but they’re crucial nonetheless. Justus von Leibig’s Law of the Minimum can be summarized this way: “The availability of the most abundant nutrient in the soil is only as good as the availability of the least abundant nutrient in the soil.”

A practical application of that law would be to say that a plant that’s chlorotic and making subpar growth due to a micronutrient deficiency won’t be improved by applying more nitrogen. Leibig’s law has been explained by using the image of a barrel where each stave of the barrel represents a different nutrient. Each stave is at a different height that’s based on the sufficiency of that nutrient. The shortest stave (nutrient) dictates how much liquid the barrel will hold before it gushes out through that opening. The shortest stave has to be raised in order for the barrel to hold more liquid (see Figure 1). Therefore, an iron-deficient plant can’t be improved by the addition of more N-P-K because iron remains the limiting factor.

Figure 1: Leibig’s law is explained by using the image of a barrel where each stave of the barrel

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shortest stave (nutrient) dictates how much liquid the barrel will hold before it gushes out through that opening. The shortest stave has to be raised in order for the barrel to hold more liquid.

Grasping this concept is helpful to avoid over-fertilizing plants. Increasing the amount of a balanced fertilizer may improve crop growth in our iron deficiency example because it contains some iron, but levels of other nutrients may be raised well above those required for optimal growth. Over-fertilization is expensive and can lead to other unintended consequences, such as increased susceptibility to insects, mites (elevated nitrogen) or excessive internode elongation (elevated phosphorus). Elevated soluble salt levels in the media can also occur, potentially leading to inhibition of growth or plant damage.

Regular media testing can take the guesswork out of optimizing nutrient levels. Individual micronutrients are available for supplementation, as well as micronutrient packages that contain most or all of the essential micronutrients when multiple micronutrients are deficient.

Media pH plays an important role in the availability of micronutrients to plants. Boron, copper, iron, manganese and zinc are optimally available for many crops with a pH in the range of 5.2 to 5.8. Molybdenum, as well as the important secondary nutrients calcium and magnesium, are more available with a media pH in the range of 6.0 to 6.6.

It's important to understand the requirements of the crops being produced. Certain crops such as calibrachoas, petunias and flowering vinca are produced in a lower media pH range to optimize the availability of iron and other micronutrients. Other crops, such as geraniums (seed and zonal) and pentas, are so efficient at taking up micronutrients that the lower pH ranges favored by the previously mentioned crops can lead to a micronutrient toxicity in these plants. One size does not fit all when it comes to optimum media pH!

Since media pH plays such an important role in micronutrient availability, let's review the factors that influence media pH:

• Limestone charge in the media—Lime incorporation rates are important, but the type of limestone and the particle size are among the variables that need to be accounted for. Growers can easily track media pH on-site; this provides valuable information for the optimization of micronutrient availability.

• Fertilizer selection—Water-soluble fertilizers are rated according to their potential alkalinity or acidity. While the ratings are helpful for predicting the net impact of fertilizers on media, more precise tools are under development. Dr. Paul Fisher's lab at the University of Florida is working on an improved method for understanding the impact of water-soluble fertilizers and media pH.

• Alkalinity of irrigation water—It's the alkalinity rather than the pH of irrigation water that's the best predictor of the effects on media pH over time. Alkalinity is the measure of dissolved bicarbonates in the water. Calcium and magnesium bicarbonates can have the effect of "liming the media" if elevated levels of alkalinity are present.

• Species effect—Research has shown that some plants exert an influence over the pH of the media that's not always in favor of the plant. Examples include geraniums and celosia, which exert a downward effect on soil pH, yet both crops perform best with a media pH above 6.0. Flowering vinca, on the other hand, can increase media pH in spite of the fact that this crop is usually produced in a range of 5.3 to 5.8.

Understanding the unique micronutrient requirements of the crops we produce, combined with regular soil testing, can lead to optimized plant growth while avoiding excessive over-fertilizing. **GT**

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