by Heidi Wollaeger
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Keep an Eye on Nutrition!

Growers should regularly test their water quality as well as media pH and EC of crops. Testing and making adjustments to your nutrition management plan will prevent nutrient deficiencies in your crop.

Greenhouse growers in Michigan are busy wrapping up transplanting and are busy shipping their product. In the flurry of the season, growers may overlook nutritional disorders in their crops. Knowing and managing water quality is extremely important to achieve a desirable media pH. As Tom Ford pointed out in e-GRO article 24 earlier this month, alkalinity of ground water can rise with both road salt and natural salt deposits. Alkalinity, also known as acid-buffering capacity, is how much acid it takes to lower the pH to a specific level. It is dependent on multiple concentrations of different ions, unlike pH, which is only dependent on the concentration of H+ and OH- ions. In Michigan, alkalinity is most affected by the concentration of calcium, sodium bicarbonate, and magnesium in the water. As the alkalinity in the water rises, it will take more acid to lower the pH to a desirable level. If the bicarbonates are not properly managed by injecting acid into the irrigation water, it increases the pH of your growing media over time. Especially, here in a Great Lakes State, where our bedrock is limestone, our ground water often has a very high alkalinity. Growers in southwest Michigan are currently reporting that their alkalinity is as high as 300 ppm and other regions can be even higher.

In addition to injecting acid, growers need to choose fertilizers that are appropriate for their crop types and their water quality. Growers choose their fertilizers (with acidic or basic reactions) and rates of elements such

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as micronutrients based on the crop type and the stage of production. Managing nutrition can be most difficult when growing young plants because there is such a small amount of media from which plants can uptake elements. For example, these petunia plugs (Figure 1) in a 512 tray likely have phosphorus and nitrogen deficiencies, which cause the purpling and chlorosis of the foliage. The pH

Figure 1. Petunia plugs growing in a 512 tray that are chlorotic with purpling lower leaves, likely due to a phosphorus and nitrogen deficiency.

of the media was 6.5, which is higher than the recommended pH for petunias (between 5.4 and 6.2). Therefore, the nutrients are not as accessible as they would be if the pH was lower. Also, these young plants likely also dried down because the edges of the tray have exaggerated symptoms. Transplanting these plugs into larger containers and increasing the fertigation (especially with a fertilizer with phosphorus) will help overcome this nutrient deficiency.

Most growers have trouble identifying nutrient

deficiencies because many of the nutrient deficiencies create similar symptoms. So, how can you tell what nutrient is deficient? Before investigating plant nutrition, growers should eliminate that the symptoms are being caused by a biotic organism or from another environmental factor. For example, nutritional issues within the crop are rather consistent among plants and are not spotty within the crop. Next, growers should determine the pH and EC of the growing substrate. Testing the media will give you insight as to whether the nutrients as a whole and the pH are at appropriate levels. For example, the petunias in Figure 2 also had a high pH. These petunias are expressing an iron deficiency by the chlorosis (or yellowing) of the new leaves.

Figure 2. Petunias showing iron deficiency symptoms due to a high media pH.

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Next, growers should use the plant nutrient deficiency key (Figure 3) to help determine which nutrient is deficient.

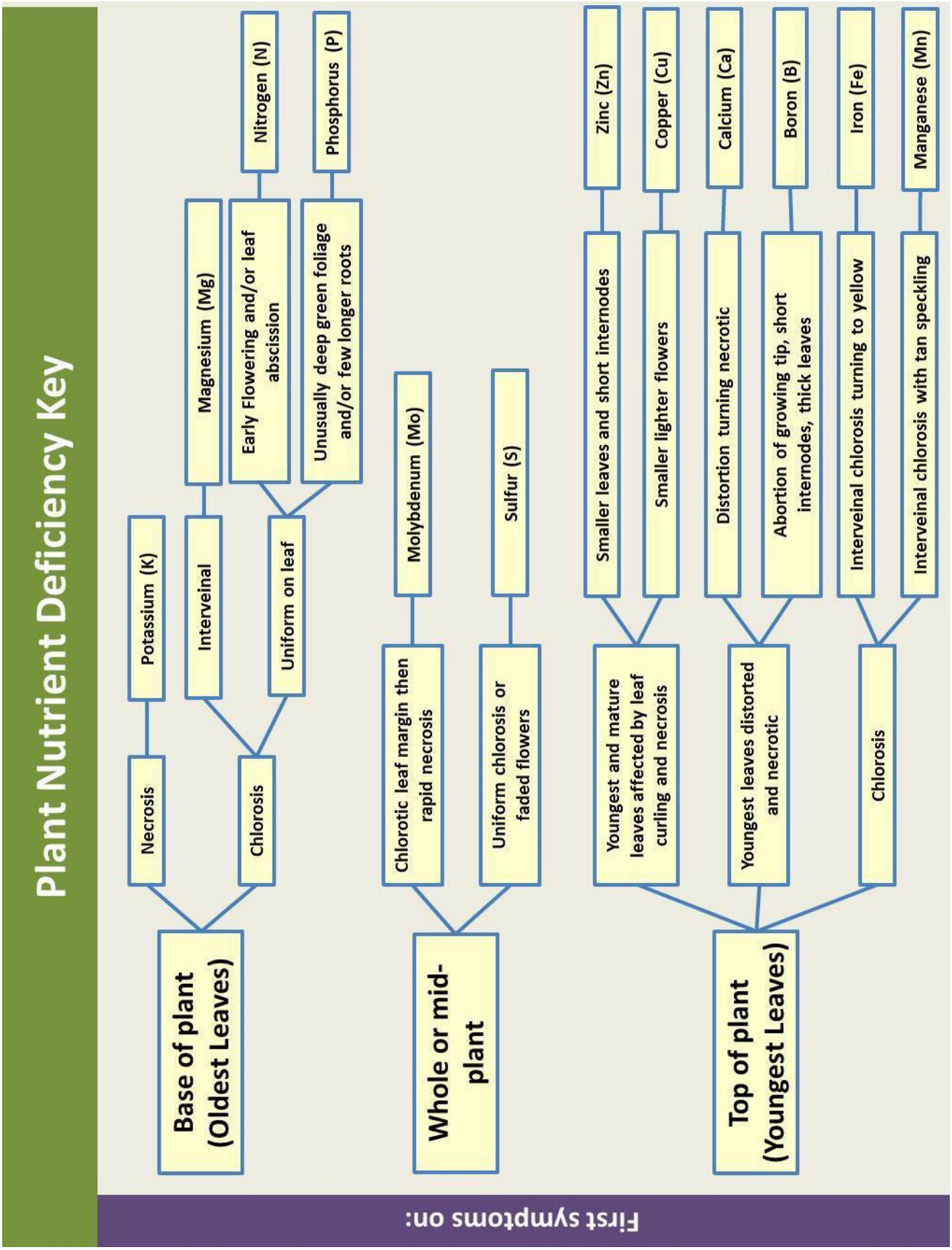

Figure 3. Growers can use this plant nutrient deficiency key to help diagnose nutrient deficiencies.

Since some elements are mobile while others are immobile in the plant, the symptoms of the deficiency will be expressed in either the base of the plant on the oldest leaves, the top of the plant on the youngest growth, or on whole plant. Growers can then use this key to come up with a hypothesis as to which element is causing the plant's symptoms. It's fairly common for there to be more than one nutrient deficiency, which makes this process more challenging.

While this deficiency key can provide growers with a starting point, we recommend that growers submit a media sample for analysis of both macro- and micro-nutrients (Figure 4). The results from these tests will ensure that growers diagnose the problem correctly and also provide better information to make a management decision on the crop.

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SOIL TESTING LABORATORY - GREENHOUSE TEST RESULTS

Joe's Greenhouse
Lollipop Lane, MI

CROP: TOMATOES
LAB: GH113
SAMPLE: GD01

		LOW OPTIMUM HIGH
PH:	6.9	
SOLUBLE SALTS (MMHO)	0.11	
PARTS PER MILLION OF:		
NITRATE-N	0.1	
AMMONIUM-N	*	
PHOSPHORUS	0.2	X
POTASSIUM	6	
CALCIUM	27	X
MAGNESIUM	7	X
SODIUM	4	XXXXX
CHLORIDE	15	XXXXXX
PERCENT OF TOTAL SALTS:		
NITRATE	0.0	
POTASSIUM	7.5	XXXXXXX
CALCIUM	32.5	XXXXXXXXXXXXXXXXXXXXXXXXX
MAGNESIUM	7.9	XXXXXXXXXXXXXXX
		ACCEPTABLE EXCESSIVE
AMMONIUM	0	
SODIUM	4.8	XXXXXXXXXX
CHLORIDE	18.3	XXXXXXXXXXXXXXXXXXXXXX

* NOT RUN

NOTE: IF SLOW RELEASE FERTILIZER HAS BEEN MIXED WITH THESE SAMPLES, THE RESULTS MAY BE SLIGHTLY INFLATED.

Figure 4. Sample media analysis of greenhouse tomato transplants.