Fixes for Mixes

Making mistakes with your growing mix can lead to numerous production problems. Learn how to correct the most common problems growers encounter in the greenhouse.

By Todd Cavins

From time to time, corrective actions will be needed in greenhouse production. Of course, the best scenario would be to prevent the problems, but that doesn't always work. As with all corrective procedures, always test a few plants with the corrective procedure prior to treating a whole crop. If using a brand-name product, be sure to read, understand and follow the label directions.

Because pH is so critical in assuring nutrient availability, it's important to test frequently, especially to verify whether a corrective procedure has worked. Here are some of the most common issues and corrective procedures for growing mixes.

Figure 1 (top): Lower-leaf bronzing from iron and manganese toxicity on this geranium was caused by low substrate pH. Figure 2 (bottom): High-alkaline water caused the substrate pH to increase, resulting in iron deficiency.

Increasing pH

Symptoms of low pH can be speckling or bronzing of the lower leaves as well as the onset of some nutrient deficiencies (Figure 1). Two options for increasing pH are the use of a liquid lime product or potassium bicarbonate. Common application rates are 2-4 quarts per 100 gallons of water. This will typically raise the pH by about half to one pH unit. This mixture will need to be kept agitated and can severely wear on injector parts if not diluted prior to use. This is often best applied by hand watering.

Potassium bicarbonate also raises the mix pH. The use rate is 1-2 pounds per 100 gallons of water. This solution is clear and easily passes through injectors and drip tubes. However, if the solution is splashed on foliage and not rinsed quickly, foliage burn is likely to occur. Be sure to follow up the next day with the application of a complete and balanced fertilizer, as the system could be overwhelmed with potassium. Some, with experience of using both a liquid lime and potassium bicarbonate, will say that the liquid lime provides more residual control or a longer lasting pH increase.

An alternative strategy would be to use basic fertilizers such as 13-2-13 or 15-0-15. While the effect will not be dramatic or immediate, in the period of one to two weeks, a moderate increase in mix pH should occur after repeated use.

Decreasing pH

High pH symptoms are generally first expressed as iron deficiency, though other problems, especially micronutrient deficiencies, can be expressed (Figure 2). For a fast-acting pH decrease, look to iron sulfate. Recommended rates will vary, but most experts agree that 2 pounds per 100 gallons of water is a good starting point. As with the potassium bicarbonate, the foliage should be rinsed after application to avoid burning. If insufficient pH drop occurs, apply the same iron sulfate solution rate again. It is better to take this approach and gradually adjust the pH versus using a high dose initially.

Acid drenches can also be used to decrease pH quickly, but there is an even higher potential risk of plant damage as well risk to those handling the solution. Most common acids can be mixed with water to create a solution pH of about 2.0. For sulfuric acid, experiment with adding 8 ounces per 100 gallons of water to see whether that drops the water pH significantly. When choosing an acid, consider that it is likely to supply additional nutrients (such as nitrogen, sulfur or phosphorus) that may influence the overall nutrient balance.

Acidic fertilizers are a good choice if a gradual pH drop is needed. There are many acidic water-soluble fertilizers available; however, be wary of repeated and/or wintertime use of products such as 20-20-20 or 21-7-7. While these two fertilizer formulations are among some of the most acidic water-soluble fertilizers available, the high urea and ammoniacal nitrogen contents can be damaging to many crops. To get the best effect from acidic fertilizers, reduce the alkalinity of the water prior to mixing or injecting the fertilizer.

Correcting Iron Deficiency

Iron deficiency is presented as upper-leaf, interveinal chlorosis and is prevalent in crops such as petunias and calibrachoa; however, it can arise on nearly any plant if the mix pH is too high (Figure 4). So, make sure the pH is on target first, and inspect the roots for damage from root rots as they can impair nutrient uptake by the plant. If the pH is high, treat with iron sulfate as described above. Not only will this lower the pH, but it will provide iron to return crops to their appropriate color more quickly.

From time to time, iron deficiency will occur even though the mix pH may be in the target range for a particular crop. For those situations, look to iron chelates. Consider foliar applications when you want a quick turnaround or roots are compromised. Iron EDTA (ethylenediaminetetraacetic acid) at 6 ounces per 100 gallons or iron DTPA (diethylene triamine pentaacetic acid) at 8 ounces per 100 gallons are general recommendations. Using a surfactant designed for foliar applications will also aid this corrective procedure.

Drench applications of chelates are also effective, and some consider them to be more effective than foliar applications, as plants are more efficient with iron chelate uptake through the roots. Though EDTA can be used, it is not as effective across a wide pH range as some others. Iron DPTA and especially iron EDDHA (ethylenediamine-N,N'-bis [2-hydroxyphenylacetic acid]) are considered to be the most readily available iron chelate across a broad pH range. Recommended rates for drench applications are 5 ounces per 100 gallons of water for all three of the chelates mentioned.

Increasing EC

Low EC (electrical conductivity) symptoms are generally lower-leaf chlorosis and decreased plant growth and vigor, which are commonly ➧

associated with nitrogen deficiency. In some situations, a purpling of the foliage veins might be noticed in some crops, and this is sometimes associated with phosphorus deficiency. Increasing the EC may be necessary if crops are receiving insufficient fertilizer. This occurs, from time to time, when attempting to grow various crops with the same fertilizer rate even though some are heavier feeders than others or excessive leaching is occurring.

For this fix, use a moderate to heavy dose of a complete fertilizer. This will ensure all necessary nutrients are supplied in the proper ratio. To determine the appropriate fertilizer rate, first determine the target EC for the crop in question, then use the fertilizer label to determine what concentration will provide the target EC.

Figure 3: This salvia's pale appearance was caused by sulfur deficiency. The water and fertilizer were void of sulfur, an essential element for plant growth.

Also, be sure to double-check the injector. This can be done with an EC meter. Once the fertilizer is mixed appropriately, check the EC of the fertilizer water "at the end of the hose." From that EC, subtract the EC of your water source to see whether the target EC is being met. While there is often not a perfect match with the label, an EC value within 10 percent is generally acceptable.

Decreasing EC

High EC or soluble salts can result in stunted plants and, in severe situations, leaf puckering or edge burn. This commonly occurs when too much fertilizer is supplied or salts from the water build up in the mix. If using a constant liquid feed strategy, simply insert a few clear water irrigations to bring the EC down. If the EC is dangerously high, then use two clear water irrigations within one hour of each other. If using subirrigation, then it may be necessary to use overhead irrigation temporarily, as subirrigation does not allow leaching.

One of the best and easiest ways to prevent these problems is to regularly test for pH and EC. This will allow for simple and gradual adjustments to be made with fertilizer selection and rates. Also, remember to include a periodic check of your fertilizer with the EC meter. From time to time, the injectors need tune-ups and adjustments; this can also can help ensure proper mixing of fertilizer.

Correcting/Preventing Magnesium or Sulfur Deficiency

Magnesium deficiency appears as lower-leaf interveinal chlorosis. Insufficient magnesium in the water source can be problematic if the chosen fertilizer doesn't supply it. An imbalanced water source (very high calcium or sodium) can also lead to magnesium deficiencies. This issue tends to show up in poinsettias, geraniums, gerberas and sweet potatoes readily. A simple application of 2 pounds of Epsom salts ($MgSO_4$) per 100 gallons of water often corrects the problem. That application can be split into two 1-pound applications per 100 gallons of water as a precaution. Another strategy to magnesium supplements is to add 4 ounces per 100 gallons of water and apply this on a constant, liquid-feed basis. This small amount can generally be blended with non-calcium-based fertilizers.

Sulfur deficiency is often described as an

overall yellowing of the plant (Figure 3). The deficiency can be distinguished from low EC or nitrogen deficiency, as those symptoms are more pronounced on the lower leaves. Similar to magnesium, if the sulfur is not provided in the water — it is generally measured as sulfate (SO_4) — then it must be supplied in the fertilizer. Not all fertilizers supply sulfur, so be sure to check the label or get assistance from your supplier or extension specialist. The same corrective procedure listed above using Epsom salts can be used to correct or prevent sulfur deficiency.

Wet-Out Problems

Peat moss is naturally hydrophobic and repels water. To overcome this, a wetting agent is needed. Most commercial mix manufacturers use wetting agents that last about six months. So, if using mix that is not fresh or mixing your own, you may need to apply wetting agent. When plants are grown without a good wetting agent, uneven growth is often a result. Another scenario that leads to less efficient wetting is when crops are repeatedly subjected to extreme wetting and drying cycles, especially in high temperatures. This can be prevalent in plug production, and some growers opt to apply a small amount of wetting agent with every irrigation to overcome the problem.

Physical Properties

How a potting mix is handled and processed can greatly affect its physical properties, thus affecting the air and water capacities or how wet it stays. There is really no true way to fix an overly compacted mix once it is in the container, but here are a few ways to prevent compromising the mix's physical properties.

Fluffing the mix should be done with a bale buster and moisture if using compressed commercial mixes. This will help redevelop the air-filled pore spaces that are removed during the baling and shipping processes. Even if you're using a loose filled product, proper fluffing and moisture will increase volume yield and enhance the physical properties prior to filling the containers. For small operations, simply pass the mix through a piece of $^1/_2$-inch hardware cloth prior to filling the containers.

After filling containers, don't nest them. This can be prevented by choosing a flat that is webbed or solid on the bottom or simply inserting a piece of cardboard between the layers or off-setting the containers so that they rest only on the rims. Large water droplets during irrigation can destroy a considerable number of air-filled pore spaces.

The bottom line: Preventing mix problems *before* they occur will save time and money. Also, choose a mix manufacturer with service, knowledge and support to help you through the challenges. GPN

Figure 4: *This petunia suffered from inefficient iron uptake, resulting in upper-leaf interveinal chlorosis.*

Todd Cavins is a technical specialist with Sun Gro Horticulture and is based in Stillwater, Okla. He can be reached at toddc@sungro.com.

LearnMore
For more information related to this article, go to www.gpnmag.com/lm.cfm/gp090803