e-GRO Alert

Ornamentals

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Phytotoxicity from incorrect iron chelate applications

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Iron deficiencies can be common in spring bedding plant production and iron chelates are frequently applied to green crops up quickly. However, more selective applications followed by thorough foliage rinsing help avoid plant damage.

I was asked to visit a grower who was having a problem in one of their double-poly film greenhouses filled with seasonal spring bedding plants. Upon entering the greenhouse, the damage was apparent. On some species, necrotic spots and margins covered leaves (Figs. 1 and 2). On other species, newer leaves exhibited cupping and curling (3 and 4). Some had both (Fig. 4)!

The two most common symptoms observed looking at the different species were necrotic and cupping foliage. These symptoms are commonly associated with damage resulting from spraying some type of pesticide. The grower had been battling thrips and some whitefly, but the one pesticide applied- and the concentration used- seemed appropriate and safe.

Figure 1. The necrotic margins and necrotic spotting on these African marigolds *(Tagetes erecta*) were among the most severe symptoms observed in the greenhouse

We continued to talk about what else the grower had been dealing with in that greenhouse. As we were talking, he said that he usually gets chlorosis on his petunias (*Petunia* spp.) and calibrachoa (*Calibrachoa* spp.) and this year he was trying to avoid that from happening. The most common cause of interveinal chlorosis on petunias and calibrachoa is a micronutrient deficiency, and iron (Fe) is frequently the deficient micronutrient of interest. The cause of Fe deficiencies can be either: 1) sufficient Fe in the rootzone is less available due to elevated pH; or 2) insufficient Fe in the rootzone. While there are different solutions specific to remedying each of these causes Fe deficiency, there is one solution that works for either cause of Fe deficiency: applying iron chelate. And it turns out an iron chelate had been applied.

Iron chelates are an effective method of providing Fe to crops with interveinal chlorosis. In addition to simply providing more Fe to plants, the chelate form makes the Fe readily available even at supra-optimal pH which would otherwise restrict Fe availability for uptake. But just like any other production technique, there are a few best management practices. While a more in-depth look at Fe chelates is presented in eGRO Alert 15.9, two best management practices we will focus on here include: 1) understanding micronutrient requirements and substrate pH groups for crops; and 2) thoroughly rinsing foliage after applying Fe chelates.

As mentioned earlier, the Fe chelate was applied to all the crops in the greenhouse, since it was delivered through an overhead sprinkler system operating across the entire space. The reason why the grower's petunias and calibrachoa usually developed interveinal chlorosis was because they are micronutrient-inefficient plant species and require higher micronutrient concentrations in the rootzone compared to other crops to maintain green foliage. These micronutrient-inefficient crops are also grown at lower substrate pHs, from 5.4 to 5.8, to increase the availability of micronutrients in the root zone. Other crops, like bedding impatiens and celosia, have no special micronutrient requirements and are grown at 5.8 to 6.2. Some crops, including African marigolds, are micronutrient-efficient crops and require low concentrations of micros or high substrate pHs (6.2-6.6) to avoid toxicity. The Fe chelate should have selectively been provided to crops that need Fe- not to everything.

Finally, an important step in applying Fe chelates is to follow up applications with a clear-water foliage rise to remove Fe chelate residue on foliage. The Fe chelate residue won't just cause phytotoxicity in general micronutrient crops like bedding impatiens or celosia or micronutrient-efficient crops like African marigolds- it can also damage micronutrient-inefficient crops like sweet alyssum that have high Fe requirements!

Interveinal chlorosis from Fe deficiencies is a common challenge in spring bedding plant production, and Fe chelates can be a great tool to green crops up. Avoid treating species and cultivars that don't have elevated Fe requirements and be sure to thoroughly rinse foliage after Fe chelate applications.

Figure 2. The residual iron chelate on foliage of this sweet alyssum (*Lobularia maritima*) resulted in necrotic leaf tips.

Figure 3. While the cupping on leaves of these bedding impatiens *(Impatiens walleriana*) is not too severe, it is another symptom of residual iron chelate on foliage following its application.

Figure 4. These celosia *(Celosia argentea*) are exhibiting severe cupping of the youngest leaves on shoot tips, as well as marginal necrosis on the most affected leaves after iron chelate was applied without a clear-water rinse afterwards.

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