

Zonal Geranium Micronutrient Toxicity



Christopher J. Currey
ccurrey@iastate.edu

While we commonly observe micronutrient deficiencies for numerous spring bedding annuals such as petunia and calibrachoa, it is not uncommon to see problems on the other end of the pH scale for geraniums and marigolds. Micronutrient toxicities can damage foliage and reduce marketability, and we will focus on the cause micronutrient toxicity, and remedies, for geraniums.

When I got the call from a grower that foliage on their zonal geraniums was starting to display some symptoms of a problem, I got into my car and headed straight out to visit them. This was the first time I had visited this grower and their new greenhouses, so on the way to the geraniums, they were showing me their production greenhouses and plant material for the spring. Once we got to the geraniums, they puled out a few hanging baskets that had the symptoms they'd seen, including chlorosis (both speckling or "netting" and larger patches) and necrotic spotting on the foliage (Figs. 1, 2, and 3). Almost immediately after seeing the symptoms on several zonal geranium plants, I felt confident we were looking at a micronutrient toxicity.

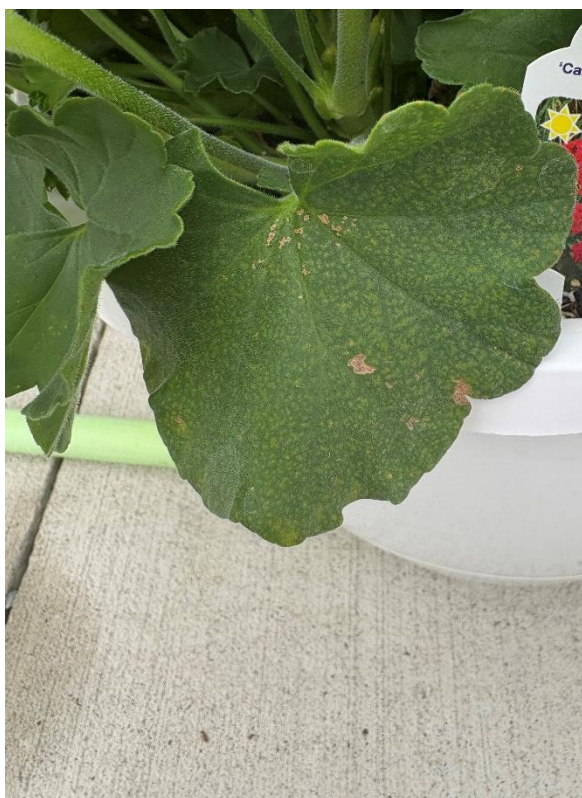


Figure 1. The chlorotic speckling or "netting" and necrotic spots on this zonal geranium leaf are common symptoms of micronutrient toxicity.

Zonal geraniums are classified as a micronutrient-efficient species, meaning they have a lower requirement for micronutrients or take micronutrients up more efficiently than other crops. Fertilizers with elevated micronutrients should be avoided for geraniums. They are also classified as a high pH crop, preferring to grow at substrate pHs ranging from 6.0 to 6.6. Since micronutrient availability in soilless substrates is influenced by pH, growing zonal geraniums at an elevated pH can restrict micronutrient availability for this micronutrient-efficient crops. Knowing this about zonal geraniums is useful, but fertilizer formulation and concentration, substrate pH, and water alkalinity and pH all contribute to micronutrient concentrations and availability- which of these factors were causing the problem on these plants?

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On the way through the greenhouses as we were walking to the affected zonal geraniums, we looked at the petunia and calibrachoa crops. They looked excellent- healthy looking plants with attractive, rich-green foliage with no signs of micronutrient deficiencies (an all-too common sight). But petunia and calibrachoa are classified as micronutrient-inefficient crops and should be grown at pHs from 5.4 to 6.0 to increase micronutrient availability for these crops. They can also be provided with fertilizers containing elevated concentrations of micronutrients. With such beautiful petunias and calibrachos, I asked what fertilizer they were using. It turns out the fertilizer was one that had elevated micronutrient concentrations specifically designed for the increased demands of micronutrient-inefficient crops. While it was a great fertilizer for petunias and calibrachoa.

Next, I asked about the substrate they were using. It was a standard mix with around 75% ground sphagnum peat moss and 25% coarse perlite (by volume) and adjusted with dolomitic limestone to a pH of 6.0. While the starting pH may have been ok, after we performed a few pour through substrate test, substrate pH ranged from 5.0 to 5.3...much lower than the target range of 6.0 to 6.6. But what was causing the low pH? When zonal geraniums are stressed, they can acidify the root zone and drop the pH. But the grower mentioned they were injecting acid into their water to help reduce alkalinity, so we decided measure the pH. The pH of the irrigation water after sulfuric acid was injected turned out to be 4.9, indicating excessive acidification causing the drop in substrate pH.

Looking at the low pH (and, presumably, alkalinity) of the irrigation water, and the use of a fertilizer with high micronutrient concentrations, we were able to determine the cause of the micronutrient toxicity. Unfortunately, there is no remedy for some symptoms of micronutrient toxicity, such as necrotic lead spot or margins. The solution is to simply grow more, new leaves that can cover up the damage- and that is exactly what the grower did. They reduced the amount of acid being injected into their irrigation water and switched to a fertilizer with lower micronutrient concentrations. Close monitoring, quick diagnoses, and prompt corrective actions by this grower allowed them to finish healthy looking and marketable zonal geraniums.



Figure 2. While this interveinal chlorosis may be reminiscent of micronutrient deficiencies for crops like petunia and calibrachoa, here it is a symptom of micronutrient toxicity on this zonal geranium.



Figure 3. Patchy chlorosis, along with necrotic spotting and necrosis along the leaf margin are more symptoms of micronutrient toxicity on zonal.



Figure 4. Unlike micronutrient deficiencies, where you can green-up a crop, there is no remedy for micronutrient toxicity symptoms like necrotic spotting. Growing new, healthy foliage to cover up the affected foliage is the best approach for finishing saleable plants. .

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CONTRIBUTORS

Dr. Nora Catlin

Floriculture Specialist
Cornell University

nora.catlin@cornell.edu

Dr. Chris Currey

Assistant Professor of Floriculture
Iowa State University

ccurrey@iastate.edu

Dan Gilrein

Entomology Specialist
Cornell Cooperative Extension
Suffolk County

dog1@cornell.edu

Dr. Chieri Kubota

Controlled Environments Agriculture
The Ohio State University

kubota.10@osu.edu

Heidi Lindberg

Floriculture Extension Educator
Michigan State University

wolleage@anr.msu.edu

Dr. Roberto Lopez

Floriculture Extension & Research
Michigan State University

rglopez@msu.edu

Dr. Neil Mattson

Greenhouse Research & Extension
Cornell University

neil.mattson@cornell.edu

Dr. W. Garrett Owen

Sustainable Greenhouse & Nursery
Systems Extension & Research
The Ohio State University

owen.367@osu.edu

Dr. Alicia Rihn

Agricultural & Resource Economics
University of Tennessee-Knoxville

arihn@utk.edu

Dr. Debalina Saha

Horticulture Weed Science
Michigan State University

sahadeb2@msu.edu

Dr. Beth Scheckelhoff

Extension Educator – Greenhouse Systems
The Ohio State University

scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo

Horticulture/ Ag. Economics
Purdue University

torres2@purdue.edu

Dr. Brian Whipker

Floriculture Extension & Research
NC State University

bwhipker@ncsu.edu

Dr. Jean Williams-Woodward

Extension Plant Pathologist
University of Wyoming

jwilwood@uwyo.edu

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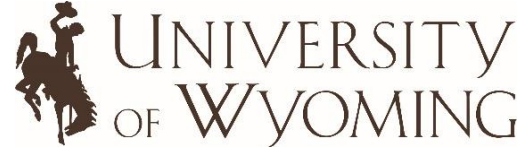
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