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Gerbera:
Diagnosing Interveinal Chlorosis of Upper Leaves

Upper leaf interveinal chlorosis (yellowing) of gerbera (Gerbera jamesonii) is an indicator of iron (Fe) deficiency and may be a result of waterlogged substrates, high substrate pH, or underdeveloped root system.

While visiting a grower, we came across a gerbera crop (Fig. 1) that exhibited interveinal yellowing (chlorosis) of the upper leaves (Fig. 2). Though the degree of interveinal chlorosis varied among individual plants (Fig. 3), the typical symptoms pointed towards high substrate pH and thus, iron (Fe) deficiency. However, without following the diagnostic process, we would have been fooled.

We followed the diagnostic process of starting big and ending small. By this, we mean looking at the big picture. Asking vital questions that may assist in potential leads causing the interveinal chlorosis. On the particular day of our visit, the sky was overcast and the outside temperatures were around the mid-40's °F. In the polyethylene-covered greenhouse, light conditions were low and there was no supplemental light provided to the gerbera crop.

Figure 1. Gerbera (*Gerbera jamesonii*) crop exhibiting interveinal chlorosis of the upper leaves.

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As we approached the crop, we noticed plants were generally similar in size and were being grown in decorative plastic terra cotta pots filled with a peat-based substrate. The only visual concern that we could see at first inspection was the interveinal chlorosis. We scouted the crop and lifted individual pots to check "how wet" the plants were. Pots were heavy and it appeared the peat-based substrate was formulated with a heavy peat or a peat with higher water-holding capacity. At this point we did two things: 1) conducted a PourThru test and 2) removed the pot to examine the root system.

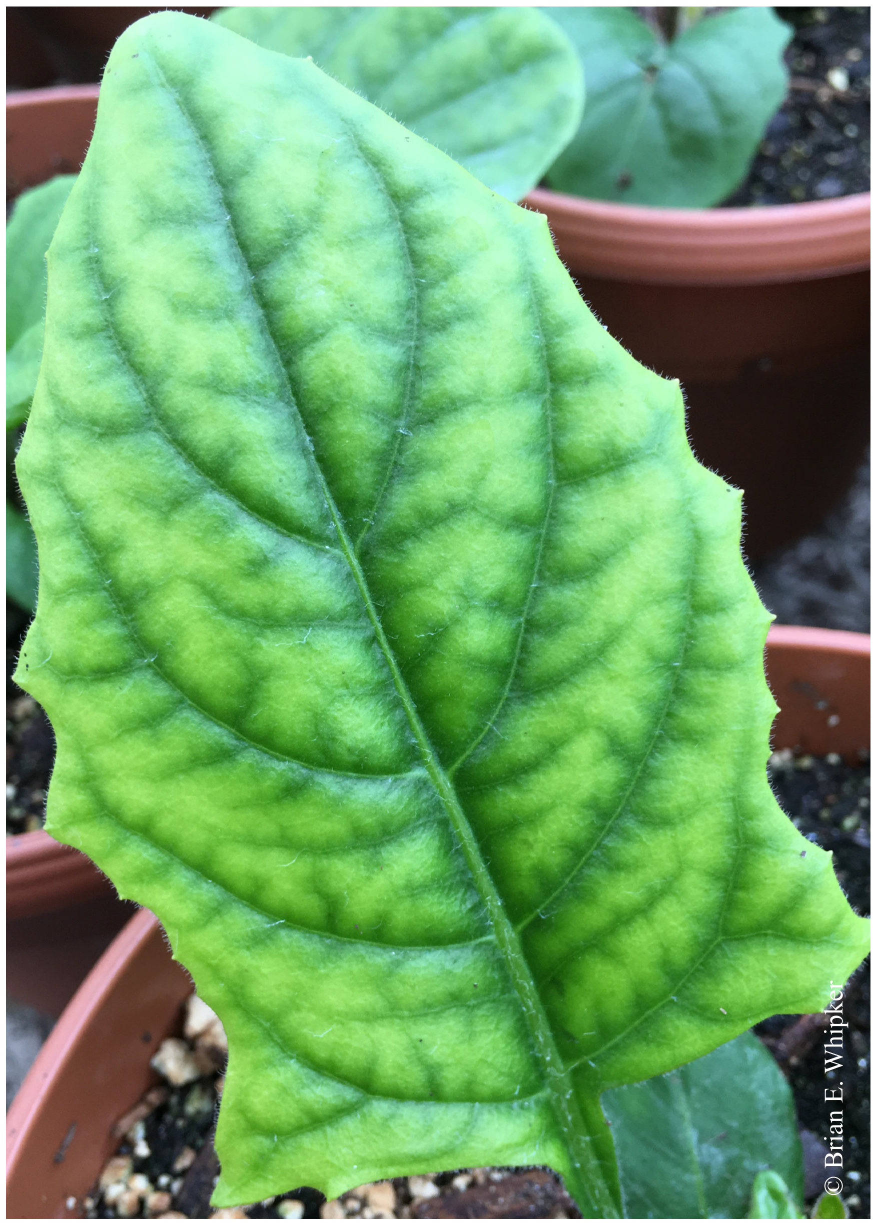

Figure 2. Interveinal chlorosis of the upper leaves of an individual gerbera (*Gerbera jamesonii*) plant.

The results of the PourThru indicated pH and electrical conductivity (EC) values of 5.8 and 4.41 mS/cm, respectively. The pH was within the recommended range (pH 5.8–6.2), though the EC was 2 to 4 times higher than the recommended EC of 1.2–2.4 mS/cm. In addition, we inspected the root system of multiple plants. We found that the gerbera plants lacked a well developed root system (Fig. 4).

Furthermore, we asked the grower about the crop's history and learned of any chemical applications that may have been made. After much discussion, we were able to narrow down our list of possible leads causing the interveinal chlorosis as a result of Fe deficiency:

1. High substrate pH.

Dismissed. Our PourThru indicated that the pH was in the recommended range of pH 5.8–6.2. Therefore, the

Figure 3. Varying intensity of interveinal chlorosis among gerbera (*Gerbera jamesonii*) plants.

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interveinal chlorosis was not a result of high substrate pH.

2. Root rot.

Plausible, but the interveinal chlorosis was uniform among the whole crop. While the root system was not extensive, the roots appeared to be a healthy white. If pathogen related, we would expect to see the interveinal chlorosis disbursed sporadically among plants or as a progression moving across the crop. In this case, the interveinal chlorosis was uniform.

3. Excessively wet or waterlogged substrates.

Plausible as the substrate was wet and formulated from a heavy peat. The grower made mention that the crop was irrigated once weekly. With this information and taking into account the weather conditions, the plants were not drying out after irrigation and as a result, interveinal chlorosis developed.

We concluded that the interveinal chlorosis was a result of small root systems because of high EC as a result of excessively wet or waterlogged substrates. Essentially, leaching or irrigating until drip out of the bottom of the pot was not occurring at each weekly irrigation event. The grower feared that if plants were irrigated until leaching, the pots would never dry out under the current outdoor environmental conditions. Without leaching, the soluble salts accumulated in the rhizosphere, stunting or inhibiting root growth. Furthermore, because of the waterlogged substrate, the gerbera plants were unable to absorb Fe.

Nonetheless, this situation can be fixed. Corrective procedures are as follows:

1. Leaching.

Leach the substrate of soluble salts by irrigating the crop with acidified water until the leachate begins to drip from the bottom of the container.

The substrate should be irrigated with 10 to 20% leaching to avoid accumulation of soluble salts (EC). Decrease the fertilization rate so leaching is not required.

2. Change fertilizer source.

Use a fertilizer that contains a higher amount of Fe.

3. Iron sulfate ($FeSO_4$) application.

Dissolve 1 to 2.5 lbs/100 gal of water.

Apply as a substrate drench.

Do not apply to foliage. Rinse foliage if iron sulfate application splashes on leaves.

Iron sulfate will increase the substrate EC level and may release toxic levels of minor elements. Recommended to test on a few plants first.

Do not overapply.

4. Fe-chelate drench application.

Apply at 5 oz./100 gal.

5. Increase growing temperatures.

Cool growing temperatures slow nutrient uptake.

Decrease fertilizer frequency or rate.

In this instance, the grower decided to leach the crop and irrigate with a constant liquid Petunia fertilizer + Fe.

From this visit, we learned that we cannot assume a problem is caused by merely one factor, but multiple causative factors may need to be identified to make the diagnosis. Finally, looking at the big picture, scouting the crop and asking questions, we were able to end focusing on a corrective procedure.

Figure 4. Gerbera (*Gerbera jamesonii*) plants lacked a development root system.