



Brian E. Whipker<sup>1</sup>



Josh Henry<sup>1</sup>



W. Garrett Owen<sup>2</sup>

## Nutritional Monitoring Series

# Gerbera

(*Gerbera jamesonii*)

Gerberas require medium levels of fertilization, growing best with 150 to 200 ppm N. Optimal substrate pH values are between 5.8 and 6.2. Gerberas are susceptible to both low and high pH disorders, developing iron (Fe) and manganese (Mn) toxicity at low pH and Fe deficiency at high pH.



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Figure 1. Low soluble salts [referred to as electrical conductivity (EC)] can result in lower leaf yellowing (chlorosis) or reddening of red-pigment containing cultivars. Photo: Brian E. Whipker.

### Target Nutrition Parameters

**pH Category III:**  
5.8 to 6.2

**Fertility Category:**  
Medium  
150 to 200 ppm N

**EC Category A:**  
1:2 Extraction:  
0.6 to 0.9 mS/cm

**SME:**  
1.3 to 2.0 mS/cm

**PourThru:**  
2.0 to 3.0 mS/cm

Gerbera

<sup>1</sup>NC State University  
bwhipker@ncsu.edu

<sup>2</sup>Michigan State University  
wgowen@msu.edu



Figure 2. High soluble salts [referred to as electrical conductivity (EC)] due to an over-application of slow release fertilizer can lead to marginal leaf browning and death (necrosis). Photo: Brian E. Whipker.



Figure 3. High substrate pH leads to interveinal yellowing (chlorosis) on the upper foliage. Photo: W. Garrett Owen.

### Fertility Management of Gerbera

Gerberas require medium levels of fertility. Growers should maintain fertilization at 150 to 200 ppm N. Low soluble salts [referred to as electrical conductivity (EC)] can cause yellowing (chlorosis) or reddening on the lower foliage (Fig. 1). High EC can lead to marginal chlorosis or browning (necrosis) of the lower leaves (Fig. 2). To lower the EC, apply clear water to leach excess salts.

Substrate pH should be maintained between 5.8 and 6.2. Lower or higher values beyond this range commonly lead to low or high pH induced nutritional disorders (Whipker et al., 2011). High pH inhibits iron (Fe) uptake, causing interveinal chlorosis of the upper foliage (Fig. 3). Low pH causes excessive uptake of Fe and manganese (Mn), which leads to toxicity symptom development. Toxicity of Fe and Mn exhibits symptoms of a lower leaf purplish coloration with black spotting (Fig. 4). [This contrasts with phosphorus deficiency which has purple leaves (Fig. 5).]

Foliar Fe and Mn concentrations should remain below 250 ppm (Bryson and Mills, 2014). Previous reports of low pH induced Fe and Mn toxicity document foliar concentrations of these two elements that were ~23× higher for Fe [3080 ppm] and 4× higher for Mn [1240 ppm] than in asymptomatic plants (Whipker and Henry, 2016). Monitoring substrate pH and periodic tissue sampling can help to determine if symptoms are due to high or low Fe and Mn (Table 1). Iron deficiency can be remedied with an application of iron chelate, while Fe and Mn toxicity can be remedied by flowable lime application to adjust (raise) the pH.

### Summary

Maintaining moderate fertility at 150 to 200 ppm N and a pH of 5.8 to 6.2 should enable you to grow healthy gerbera while preventing low or high pH induced nutritional disorders.

**Literature Cited**

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Figure 4. Low pH leads to iron (Fe) and manganese (Mn) toxicity, causing symptoms of dark brown to black spotting. Photo: Brian E. Whipker.



Figure 5. Lower leaves of a gerbera with a purple coloration due to low phosphorus. Photo by: Brian E. Whipker.

**Table 1. Recommended range of leaf tissue analysis for gerbera (*Gerbera jamesonii*).**

Element	Sufficiency Range <sup>1</sup>
Nitrogen (%)	1.35 – 3.50
Phosphorus (%)	0.20 – 0.50
Potassium (%)	2.50 – 4.50
Calcium (%)	1.00 – 2.50
Magnesium (%)	0.20 – 0.70
Sulfur (%)	0.25 – 0.70
Iron (ppm)	50 – 200
Manganese (ppm)	40 – 250
Zinc (ppm)	25 – 200
Copper (ppm)	6 – 50
Boron (ppm)	20 – 60
Molybdenum (ppm)	0.20 – 0.60

<sup>1</sup> Source: Bryson and Mills (2014)

## Corrective Procedures for Modifying Substrate pH and Electrical Conductivity (EC)

When the pH or substrate electrical conductivity (EC) drifts into unwanted territory, adjustments must be made. Below are the standard corrective procedures used to modify the substrate pH and EC for greenhouse grown crops in soilless substrates.

### 1. Low Substrate pH Correction

When Fe and Mn toxicity becomes a problem, adjust (raising) substrate pH to the recommended pH range. Corrective procedures to raise low pH levels are listed below. Switching to a basic fertilizer when the substrate pH is nearing the lower limit will help stabilize the pH. If the pH is below the recommended range, then corrective procedures will need to be implemented. Flowable lime is one option. Using a rate of 2 quarts per 100 gallons of water will typically increase the substrate pH by roughly 0.5 pH units. Two quarts can be used through an injector. Additional applications can be made if needed. Potassium bicarbonate ( $\text{KHCO}_3$ ) can also be applied. A rate of 2 pounds per 100 gallons of water will increase the substrate pH by roughly 0.8 pH units. This treatment will also provide excessive potassium (K) and cause a spike in the substrate EC. A leaching irrigation with clear water is required the following day to restore the nutrient balance (the ratio of K:Ca:Mg) and lower the EC. As always, remember to recheck your substrate pH to determine if reapplications are needed.

## pH Adjustment Recommendations

### *Flowable Lime*

- Use 1 to 2 quarts per 100 gallons of water.  
Rinse foliage.
- Avoid damage to your injector by using rates of 2 quarts per 100 gallons of water, or less.
- Can split applications.

### *Hydrated Lime*

- Mix 1 pound in 3 to 5 gallons of WARM water. Mix twice. Let settle. Decant liquid and apply through injector at 1:15.
- Caustic (rinse foliage ASAP and avoid skin contact)

### *Potassium Bicarbonate ( $\text{KHCO}_3$ )*

- Use 2 pounds per 100 gallons of water
- Rinse foliage immediately.
- Provides 933 ppm K.
- Leach heavily the following day with a complete fertilizer to reduce substrate EC and restore nutrient balance.
- Rates greater than 2 pounds per 100 gallons of water can cause phytotoxicity!

### 2. High Substrate pH Correction

The target pH for many species is between 5.8 and 6.2. Higher pH values will result in Fe deficiency and lead to the development of interveinal chlorosis on the upper leaves. Check the substrate pH to determine if it is too high. Be careful when lowering the substrate pH, because going too low can be much more problematic and difficult to deal with.

### *Acid-based Fertilizer*

If the substrate pH is just beginning to increase, then first consider switching to an acidic-based fertilizer. These ammoniacal-nitrogen (N) based fertilizers are naturally acidic and plant nitrogen uptake will help moderate the substrate pH over a week or two.

### *Acid Water Drench*

Some growers use this intermediate correction if pH levels are not excessively high and a quick lower of the substrate pH is desired. Use sulfuric acid to acidify your irrigation water to a pH 4.0 to 4.5. Apply this acid water as a substrate drench providing 5 to 10% excessive leaching of the substrate. Rinse the foliage to avoid phytotoxicity. Results should be visible within 5 days. Retest the substrate pH and repeat if needed.

### *Iron Drench*

If the levels are excessively high, then an Fe chelate application can be made to the substrate.

Below are the options.

### *Iron Chelate Drench (options)*

- Iron-EDDHA: mix 5 ounces in 100 gallons of water
- Iron-DTPA: mix 5 ounces in 100 gallons of water
- Iron sulfate: mix 4-8 ounces in 100 gallons of water
- Apply as a substrate drench with sufficient volume to leach the pot.
- Rinse foliage immediately.
- Avoid use on iron efficient plants (geraniums).

## 3. Low EC Correction

If low EC problems occur, increase the fertilization rate to 300 ppm N for a few applications before returning to the recommend fertilization rate for the crop.

## 4. High EC Correction

Excessively high fertilization rates will result in a marginal leaf burn. Check the substrate EC to confirm your diagnosis. Values greater than 6.0 mS/cm based on the PourThru sampling method can be problematic for many plants.

### *Switch to Clear Water Irrigations*

If the substrate EC is just beginning to increase over time, then leach with a few clear water irrigations to lower EC levels by flushing out the salts.

### *Clear Water Leaching*

If the EC values are excessively high, leach the substrate twice with back-to-back clear water irrigations. Then allow the substrate to dry down normally before retesting the EC. If EC levels are still too high, repeat the double leach. Once the substrate EC is back within the normal range, use a balanced fertilizer at a rate of 150 to 200 ppm N.



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**CONTRIBUTORS**

Dr. Nora Catlin  
Floriculture Specialist  
Cornell Cooperative Extension  
Suffolk County  
[nora\\_catlin@cornell.edu](mailto:nora_catlin@cornell.edu)

Dr. Chris Currey  
Assistant Professor of Floriculture  
Iowa State University  
[ccurrey@iastate.edu](mailto:ccurrey@iastate.edu)

Dr. Ryan Dickson  
Extension Specialist for Greenhouse  
Management & Technologies  
University of New Hampshire  
[ryan.dickson@unh.edu](mailto:ryan.dickson@unh.edu)

Thomas Ford  
Commercial Horticulture Educator  
Penn State Extension  
[tf7@psu.edu](mailto:tf7@psu.edu)

Dan Gilrein  
Entomology Specialist  
Cornell Cooperative Extension  
Suffolk County  
[dog1@cornell.edu](mailto:dog1@cornell.edu)

Dr. Joyce Latimer  
Floriculture Extension & Research  
Virginia Tech  
[jlatime@vt.edu](mailto:jlatime@vt.edu)

Heidi Lindberg  
Floriculture Extension Educator  
Michigan State University  
[wolleage@anr.msu.edu](mailto:wolleage@anr.msu.edu)

Dr. Roberto Lopez  
Floriculture Extension & Research  
Michigan State University  
[rlopez@msu.edu](mailto:rlopez@msu.edu)

Dr. Neil Mattson  
Greenhouse Research & Extension  
Cornell University  
[neil.mattson@cornell.edu](mailto:neil.mattson@cornell.edu)

Dr. W. Garrett Owen  
Floriculture Outreach Specialist  
Michigan State University  
[wgowen@msu.edu](mailto:wgowen@msu.edu)

Dr. Rosa E. Raudales  
Greenhouse Extension Specialist  
University of Connecticut  
[rosa.raudales@uconn.edu](mailto:rosa.raudales@uconn.edu)

Dr. Beth Scheckelhoff  
Extension Educator - Greenhouse Systems  
The Ohio State University  
[scheckelhoff.11@osu.edu](mailto:scheckelhoff.11@osu.edu)

Lee Stivers  
Extension Educator - Horticulture  
Penn State Extension  
Washington County  
[ljs32@psu.edu](mailto:ljs32@psu.edu)

Dr. Paul Thomas  
Floriculture Extension & Research  
University of Georgia  
[palthomas@uga.edu](mailto:palthomas@uga.edu)

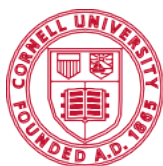
Dr. Ariana Torres-Bravo  
Horticulture / Ag. Economics  
Purdue University  
[torres2@purdue.edu](mailto:torres2@purdue.edu)

Dr. Brian Whipker  
Floriculture Extension & Research  
NC State University  
[bwhipker@ncsu.edu](mailto:bwhipker@ncsu.edu)

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