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Ironing Out Chlorosis: Selecting and Applying Iron Chelates Correctly

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Iron chlorosis is most often caused by elevated substrate pH and irrigation water alkalinity that tie up iron, and this Alert outlines how to confirm the problem and choose and apply the right iron chelate for reliable correction and prevention.

Iron chlorosis (yellowing; Fig. 1) is one of the most persistent and economically frustrating micronutrient disorders in floriculture production. Crops often look uniform and vigorous early in the crop cycle, then develop interveinal chlorosis on newly expanding leaves as substrate pH drifts upward. In most cases, the issue is not a lack of iron in the fertilizer program, but a loss of iron availability as substrate pH increases and irrigation water alkalinity push iron out of solution.

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Figure 1. Petunias exhibiting interveinal chlorosis (yellowing) caused my high substrate pH limiting iron availability. Photo by: Dr. W.G. Owen, OSU.

Correcting and preventing iron deficiency requires more than adding iron. It requires understanding root-zone chemistry, selecting the appropriate iron chelate, and applying drenches or foliar sprays correctly. Effective iron management links water quality, substrate buffering, fertilizer selection, and crop physiology. When these pieces are aligned, chlorosis becomes a manageable production issue instead of a recurring frustration.

This is also why chlorosis can seem to appear overnight. A crop may receive adequate iron for weeks, then quickly turn chlorotic once the root-zone shifts into conditions that limits iron availability. Before selecting a chelate or making a corrective application, start with the fundamentals: how pH and alkalinity control iron solubility and whether the iron being supplied is available to the plant.

Root-Zone pH & Alkalinity Drive Iron Availability

In soilless substrates, iron availability depends primarily on root-zone pH. As pH rises, iron in solution rapidly converts to ferric iron (Fe^{3+}), which reacts with hydroxides and carbonates and becomes insoluble. The pH response is steep, so small increases in substrate pH can quickly reduce soluble iron in the root-zone. This is why iron deficiency symptoms frequently develop in floriculture crops that are being fertilized correctly, particularly when pH drifts above the crop's target range.

In most greenhouse systems, that upward pH drift is driven by irrigation water alkalinity, meaning the water's acid-neutralizing capacity, which is primarily due to dissolved bicarbonates and carbonates often associated with calcium and magnesium, and sometimes sodium. Alkalinity levels vary widely by location and water source. In peat- and bark-based substrates, each irrigation delivers these bicarbonates and carbonates that neutralize acidity from the fertilizer solution and the substrate, gradually raising pH unless an acidifying strategy is implemented. Substrate pH drift is typically faster when irrigation water alkalinity is high, leaching is minimal, fertilizers supply little ammonium nitrogen (low potential acidity), or limestone rates are excessive or highly reactive. When these factors occur together, substrate pH can move out of the crop's preferred range and iron precipitation accelerates, especially in iron-sensitive crops.

When soluble iron is limited or no longer available, symptoms appear in the recently expanded leaves first. Iron is relatively immobile in plant tissue, so interveinal chlorosis develops on newly expanding leaves while older foliage often remains green (Fig. 2). As iron deficiency worsens, new growth can become very pale yellow or even bleached (white; Fig. 3), and shoot growth slows, delaying canopy fill and finish. Because symptoms are strongly linked to root-zone conditions, troubleshooting should start by confirming substrate pH using a consistent method such as PourThru, saturated media extraction (SME), or a 1:2 dilution. To learn more about methods and sampling procedures, visit: **FertDirtSquirt.com**. Correcting chlorosis without verifying pH often leads to repeated iron applications with uneven results because the underlying chemistry has not changed.

Once you confirm that pH and alkalinity are limiting iron solubility, the next step is selecting a chelate.

Chelation: Keeping Iron Soluble at High pH

Chelates are used in greenhouse production because they keep iron soluble under root-zone conditions that would otherwise limit availability. As substrate pH rises, iron readily reacts with hydroxides and carbonates and precipitates into insoluble forms that roots cannot absorb. Chelation binds iron into a soluble complex, reducing rapid precipitation and extending the time iron remains available in the root zone. Instead of a short, high pulse of iron that quickly drops out of solution, chelated iron maintains a lower but more consistent pool of soluble iron near the roots. That steady availability improves corrective response and reduces the need for repeated applications when pH is high or drifting upward.

Chelate performance depends on stability across the substrate pH range. As pH increases, hydroxide ions and other competing ions place greater pressure on the chelate complex. Less stable chelates release iron sooner, increasing the likelihood of precipitation before uptake occurs, whereas more stable chelates maintain soluble iron at a higher pH. This is why chelate selection becomes more important as substrate pH rises. Also, it's important to note that chelates do not lower substrate pH or neutralize irrigation water alkalinity, so if alkalinity continues to drive pH upward, symptom improvement may be temporary unless the underlying high-pH inducing cause is corrected.

Choosing Between Chelated and Sulfate Iron Sources

When substrate pH is within the crop's target range, non-chelated sources such as ferrous sulfate can supply iron effectively and at lower cost per unit of iron. Under those conditions, the iron released from ferrous sulfate remains soluble long enough for root uptake, so performance is generally reliable and economical.

The difference becomes important as pH rises. Ferrous sulfate releases iron quickly into the substrate solution, but under elevated or rising substrate pH conditions, that iron can rapidly convert to less soluble

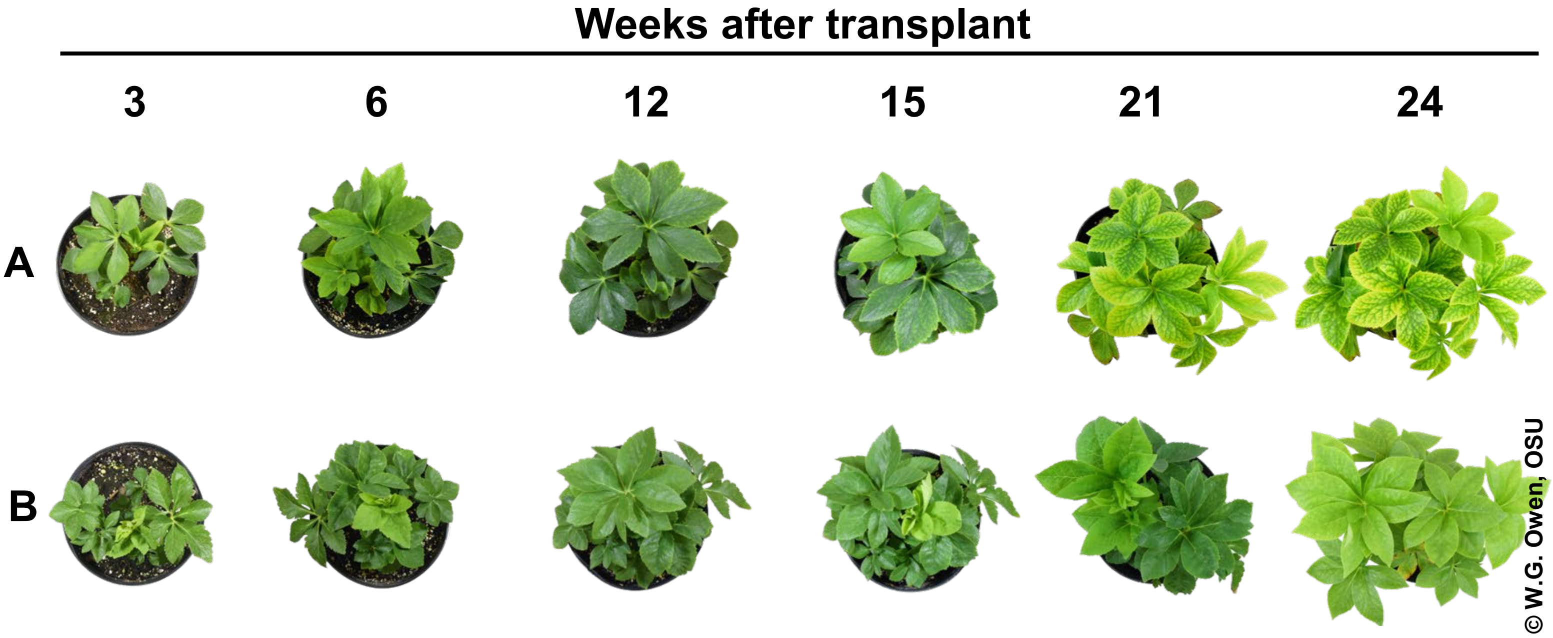

Figure 2. Progression of interveinal chlorosis (yellowing) development in (A) ‘Rio Carnival’ and (B) ‘Sandy Shores’ hellebores (*Helleborus* x*hybridus*) grown in a peat-based substrate and provided with 150 ppm N from 17-4-17 water-soluble fertilizer. Substrate pH and leaf tissue nutrient concentration analysis confirmed substrate pH drift and declining leaf tissue iron concentrations over the crop cycle. Figure by: Dr. W.G. Owen, OSU

forms and precipitate before roots absorb it. In those situations, ferrous sulfate often provides only short-term improvement and may require repeated applications to maintain green foliage. Chelated iron, by contrast, keeps iron soluble longer and reduces rapid tie-up, increasing the likelihood of uptake under high alkalinity situations. As a result, chelated iron typically provides more consistent correction when substrate pH is above the recommended crop pH range.

Chelated micronutrients are common in complete greenhouse fertilizers because they are highly soluble and formulation-friendly. Most water-soluble fertilizers contain EDTA-chelated micronutrients, some use the more stable DTPA, and fewer use the even more stable EDDHA. For troubleshooting and corrective applications, the practical decision is to select a chelate with enough stability for the measured substrate pH. While chelated manganese, zinc, and copper can offer advantages in very high-pH situations, the performance difference between chelated and sulfate forms is most pronounced with iron.

Iron Chelate Forms Used in Greenhouse Production

Iron chelates differ mainly in stability as pH rises, which drives how reliable they are for preventing or correcting chlorosis. A useful rule is to match chelate strength to your measured substrate pH and irrigation water alkalinity. When pH is in range, a “weaker” chelate can maintain adequate soluble iron at lower cost. As pH drifts upward, you often need a more stable chelate to keep iron in solution long enough for root uptake. Below are the three most common iron chelates used in greenhouse production and how each typically fits into production and corrective programs.

Iron EDTA (Fe-EDTA)

Iron EDTA (ethylenediaminetetraacetic acid) is the most common chelated iron source in complete water-soluble fertilizers. It performs best as a maintenance chelate when substrate pH is within the crop’s target range. Under slightly acidic conditions, Fe-EDTA keeps enough iron soluble to support steady uptake and consistent background nutrition.

As substrate pH rises, often around pH 6.5 and above, Fe-EDTA becomes progressively less reliable. At higher pH, the EDTA complex is more easily disrupted, and iron is more likely to drop out of solution and precipitate before roots can absorb it. In that situation, simply applying more Fe-EDTA often does not solve the problem because the limitation is stability, not total iron supply. For that reason, Fe-EDTA is generally a poor choice for correcting chlorosis when high substrate pH is the primary cause.

Common Fe-EDTA products include Jack's Elementals – Iron EDTA, Sequestrene Fe, and many other comparable products, along with many complete fertilizers that list iron as EDTA-chelated on the label.

Iron DTPA (Fe-DTPA)

Iron DTPA (diethylenetriaminepentaacetic acid) forms a more stable complex with iron than EDTA, so it is often a practical first-line corrective chelate when substrate pH has drifted above the target pH range. Under many greenhouse conditions, Fe-DTPA remains effective up to about pH 7.0, making it a common choice for corrective drenches when pH is elevated but still below the range where Fe-EDDHA is typically needed.

Applied as a uniform substrate drench with adequate volume, Fe-DTPA often produces visible improvement within several days. The most meaningful recovery is seen as green newly expanding leaves, since chlorotic leaves typically do not fully regain color. If substrate pH remains high or continues to increase, chlorosis can recur because DTPA stability declines as pH rises. Correction is most consistent when Fe-DTPA is paired with steps to reduce irrigation water alkalinity and lower substrate pH back into the crop's preferred pH range.

Common Fe-DTPA products include Jack's Elementals – Iron DTPA, Sequestrene 330, Sprint 330, and many other comparable products (Fig. 4).

Iron EDDHA (Fe-EDDHA)

Iron EDDHA [ethylenediamine-N,N'-bis(2-hydroxyphenyl)acetic acid] is typically the most stable iron chelate used in greenhouse production. It is the most reliable option when substrate pH is high enough that Fe-EDTA and Fe-DTPA provide inconsistent results. Iron EDDHA can maintain iron solubility above pH 7.0 and is especially useful when irrigation water alkalinity is high and pH cannot be corrected easily and quickly.

Not all Fe-EDDHA products are identical. They vary in the proportion of EDDHA forms present, and products higher in the ortho-ortho form are generally more effective at keeping iron soluble and available in high-pH substrates. Because Fe-EDDHA is usually more expensive per unit iron, it is best used strategically based on measured substrate pH and crop need rather than as a routine default when substrate pH is already in the

Figure 3. Petunia exhibiting leaf and overall plant bleaching (whitening) as a result of severe iron deficiency caused by high substrate pH. Photo by: Dr. W.G. Owen, OSU.

Figure 4. Example of two different iron-DTPA products seen at in greenhouses. Photos by: Dr. W.G. Owen, OSU.

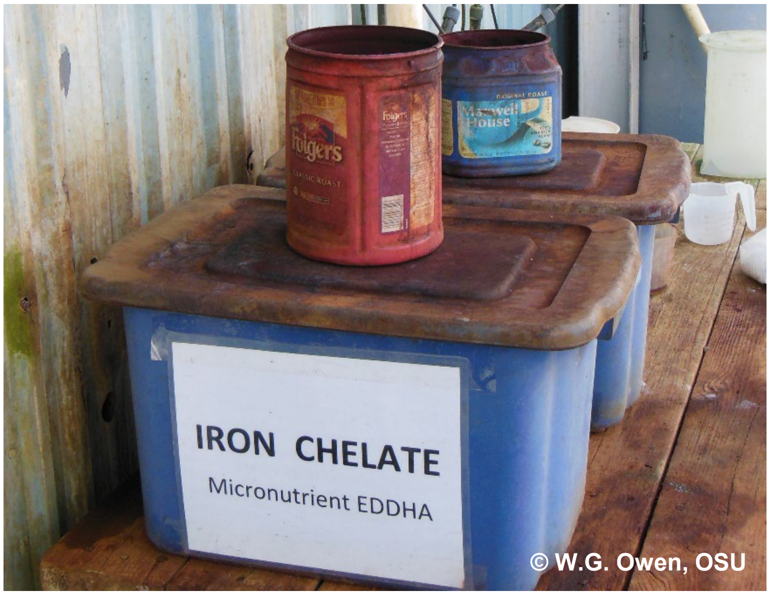

Figure 5. Example of an iron-DDHA product seen at in greenhouses. Photos by: Dr. W.G. Owen, OSU.

target range. In greenhouses with many differing crops, targeted use helps control cost and reduces the risk of overcorrecting iron-efficient crops.

Common Fe-EDDHA products include Jack's Elementals – Iron EDDHA, Sequestrene 138, Sprint 138, and many other comparable products (Fig. 5).

With the major chelate types defined, the next step is turning this into a practical selection guide that matches chelate choice to measured substrate pH, irrigation water alkalinity pressure, and crop sensitivity.

Selecting the Appropriate Chelate

Start iron chelate selection with numbers, not symptoms. Measure substrate pH and review irrigation water alkalinity results before choosing an iron source. Visual chlorosis alone is not a reliable guide because the same interveinal yellowing can occur under different root-zone conditions, and repeated applications of a chelate that are too weak for the current pH commonly produce frustrating, short-lived results.

A practical way to select the appropriate chelate is to match chelate stability to your measured substrate pH, then adjust for crop sensitivity and irrigation water alkalinity pressure:

- **Fe-EDTA:** Best for maintenance when substrate pH is 5.8 to 6.2 or only slightly elevated.
- **Fe-DTPA:** Best for correction when substrate pH is 6.3 to 6.8.
- **Fe-EDDHA**: Best when substrate pH is 6.8 and higher, and when irrigation water alkalinity is high or pH cannot be corrected quickly.

Avoid under- and over-selecting chelate strength. If the chelate is too weak, iron precipitates before uptake and you end up repeating applications. If the chelate is stronger than necessary, costs increase and the risk of micronutrient imbalance or toxicity increases, particularly in iron-efficient crops and in greenhouses with mixed crops. Matching chelate strength to measured pH is the most efficient method to consistent correction.

Once the correct chelate is selected, consistent results depend on applying it at the right rate and with the right application method.

Recommended Corrective Application Rates and Application Method

Corrective iron chelate applications are most reliable when applied as a uniform substrate drench that thoroughly wets the entire root ball. When applying iron chelates, solution volume is as important as concentration because the goal is complete root-zone coverage. Apply enough solution to achieve ~10% leaching, which helps move the chelate throughout the root-zone rather than leaving it concentrated in a single area. To how to properly apply a substrate drench of iron chelate to your crop, refer to the e-GRO Video: Properly Applying An Iron Chelate Drench.

Corrective Iron Chelate Substrate Drench Rates

Use label directions as the final authority, then fine-tune based on symptom severity, crop sensitivity, and measured substrate pH.

- **Fe-DTPA:** Apply 4 to 8 oz per 100 gal as a corrective drench. These rates deliver roughly 30 to 60 ppm Fe when using a 10% Fe product. If your Fe-DTPA product has a different iron percentage, adjust proportionally to target a similar ppm Fe range.
- **Fe-EDDHA:** Apply 2 to 5 oz per 100 gal as a corrective drench, adjusted for product concentration and chlorosis severity. Apply enough volume to wet the entire root ball and achieve slight leaching.

Once a substrate drench has been applied, rinse foliage and flowers immediately (Fig. 6) with clear water to remove any iron solution that contacted plant tissues. Concentrated iron left on leaves can cause spotting, staining, or phytotoxicity, especially under high light and warm conditions. After application, evaluate recovery based on newly expanding growth. Leaves that are already chlorotic often do not fully re-green, so the best indicator of success is whether new leaves emerge greener and more normal as uptake resumes.

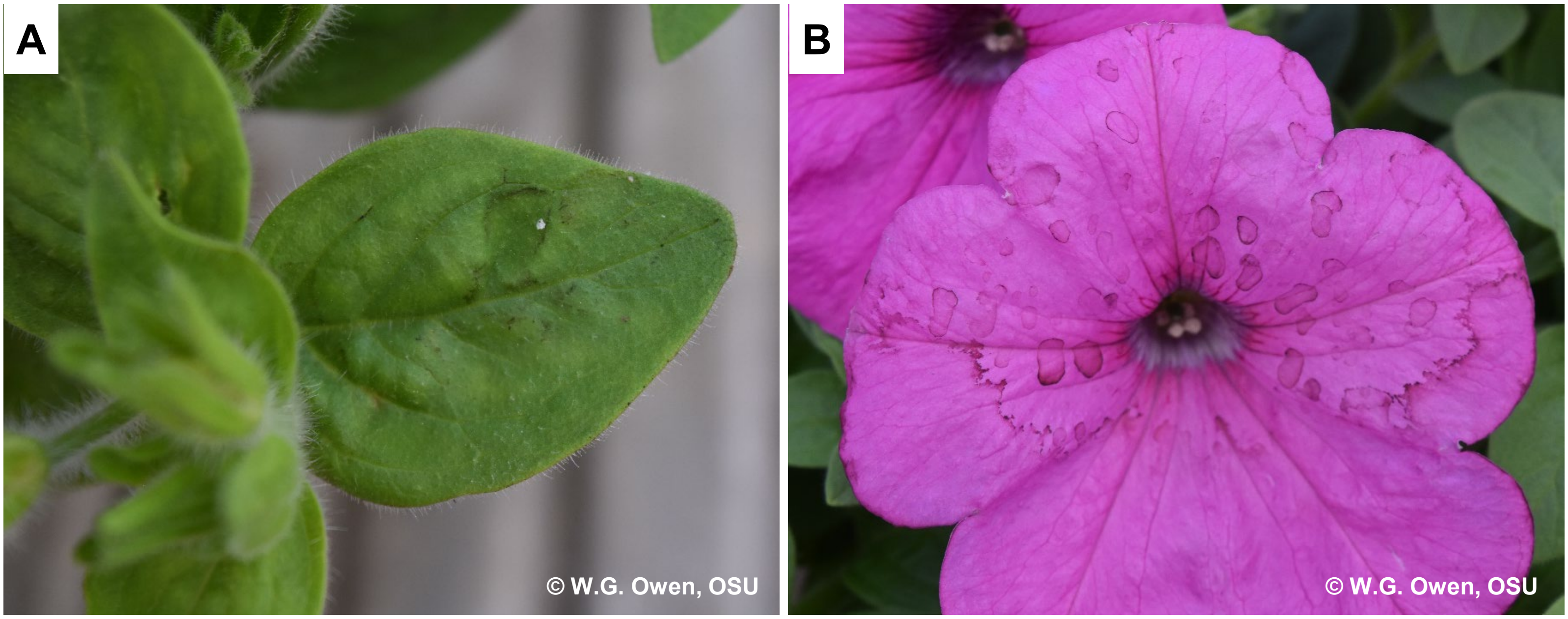

Figure 6. Example of petunia drenched with an iron chelate. The (A) leaves and (B) flowers exhibit signs of iron chelate residue which may cause leave and flower burn and reduce the aesthetic quality of crop. Photos by: Dr. W.G. Owen, OSU.

Foliar Sprays: Where they Fit and Where they Do Not

Foliar sprays can improve crop appearance more quickly when crops are finishing or when ship or sell dates are tight, but they do not correct elevated substrate pH or irrigation water alkalinity challenges. If the underlying root-zone conditions remain unchanged, symptoms can return and repeat sprays may be needed. Use foliar applications as a short-term aesthetic tool that complements, but does not replace, root-zone correction.

Suggested foliar spray concentration to target 60 ppm Fe:

- **Fe-DTPA:** 8 oz per 100 gal for a 10% Fe product
- **Fe-EDTA:** 6.1 oz per 100 gal for a 13% Fe product

Adjust rates proportionally if the product contains a different percentage of iron. Always follow the label.

For iron chelate foliar sprays, avoid excessive concentrations and account for crop sensitivity and application conditions. Never use iron sulfate as a foliar spray. Before treating an entire crop, spray a small test group and wait 3 days to observe any phytotoxicity. If no injury is observed, proceed cautiously with broader application. Repeat sprays can be made every 5 to 7 days, as needed, until the crop regains its green appearance.

Apply the iron chelate solution to both sides of the leaves, because iron uptake occurs primarily through the leaf underside. Aim for thorough coverage without excessive runoff. An organosilicon surfactant or similar product labeled for fertilizer sprays can improve coverage and uniformity. To reduce the likelihood of injury, apply sprays early in the morning under cooler temperatures and lower light levels, and allow foliage to dry promptly with good air movement.

Do not rinse foliage immediately after application unless the product label instructs otherwise. Chelated iron requires time on the leaf surface for absorption and washing it off too soon can reduce effectiveness. If heavy residue or over-application occurs, a gentle rinse later, after the spray has dried and had time to work, may reduce spotting or phytotoxicity risk on sensitive crops.

Application success also depends on crop response, since some species and cultivars are inherently more prone to iron chlorosis than others.

Table 1. List of common floriculture crops that are grouped based on their response to substrate pH.

Petunia Group (Iron-inefficient)		**Geranium Group** (Iron-efficient)
pH target 5.4 – 6.2 (Avoid *HIGH* substrate pH problems)		**pH target 6.0 – 6.6 (Avoid *LOW* substrate pH problems)**
Azalea	Nemesia	Geranium, zonal
Argyranthemum	Pansy	Geranium, seed
Bacopa	Petunia	Lisianthus
Bidens	Scaevola	Marigold, African
Brachyscome	Snapdragon	Marigold, French
Diascia	Verbena	New Guinea impatiens
Dianthus	Vinca	Pentas
Lobelia	Viola	Zinnia

Iron-Inefficient and Iron-Efficient Crops

Not all crops respond the same way when substrate pH rises. Iron-inefficient crops, such as calibrachoa, often develop interveinal chlorosis quickly as pH drifts upward because they have limited ability to mobilize iron in the root zone. In contrast, iron-efficient crops such as zonal geranium typically remain green at higher pH, but they can be more susceptible to iron and manganese toxicity when pH is too low or when excessive iron chelate is applied. Knowing which group your crop falls into helps you set pH targets, prioritize monitoring, and decide when an iron chelate is warranted as a corrective measure.

Petunia Group: Quick to Yellow as pH Rises

The “Petunia Group” are crops prone to iron deficiency because they have a limited ability to scavenge for iron when substrate pH is high, or fertilizer application rate is low. A list of iron-inefficient crops are provided in Table 1. These crops are commonly the first to show iron chlorosis when substrate pH drifts above the recommended range. For this group, target a substrate pH of 5.4 to 6.2. Once substrate pH drifts above 6.2, iron chlorosis can develop rapidly.

Management guidance: Monitor substrate pH closely and respond quickly if pH drifts upward. If chlorosis appears, a corrective iron drench can restore green color in newly expanding growth, but long-term success depends on lowering substrate pH back into the target range.

Geranium Group: More Tolerant of Higher pH

The “Geranium Group” includes crops that are very efficient at taking up iron and manganese from the substrate solution. Because of this, they are less likely to develop upper leaf interveinal chlorosis at high substrate pH, but they are more prone to micronutrient toxicity when pH is too low or when strong iron chelates are applied unnecessarily. Micronutrient toxicity, such as iron and manganese toxicity, will develop on the lower, older leaves as spotting or bronzing (Fig. 7). A list of iron-efficient crops are provided in Table 1. For this group, maintain a substrate pH of 6.0 to 6.6. Chlorosis is less common in this range, and unnecessary iron applications can increase the risk of micronutrient toxicity.

Important caution: Do not apply iron chelates without substrate pH confirmation. In greenhouses with mixed crops, blanket applications can correct one crop while causing phytotoxicity or iron and manganese toxicity in another. As such, use caution if iron chelate application is needed.

Mixed-Crop Production Considerations

When treating iron-sensitive crops, apply drenches only to affected plants or containers and avoid runoff into adjacent pots. Evaluate recovery based on greener newly expanding growth in the treated crop rather than expecting older leaves to fully re-green. If new growth does not green up within 5 to 7 days, re-check substrate pH and review irrigation water alkalinity and fertilizer selection.

The most effective strategy is prevention. Managing irrigation water alkalinity and maintaining substrate pH within the target range reduces the need for corrective iron chelate applications.

Preventing Chlorosis

Preventing iron chlorosis is almost always more effective, and less expensive, than chasing symptoms with repeated corrective applications. The most consistent control comes from keeping substrate pH in the crop's recommended range and managing irrigation water alkalinity that drives substrate pH upward over time. That requires routine monitoring and a plan to keep the root-zone chemically stable.

Build prevention around core root-zone best management practices:

1. Monitor substrate pH on a regular schedule using PourThru, SME, or the 1:2 dilution method.
2. Test irrigation water at least annually (and whenever the water source changes) for pH, electrical conductivity, alkalinity, and mineral content.
3. Use acid injection when alkalinity is high enough to cause pH drift.
4. Match fertilizer to water quality by selecting an appropriate potential acidity and ammonium fraction to counter alkalinity pressure.
5. Avoid excessive or overly reactive limestone rates that can push substrate pH above the crop's optimal range.
6. Manage leaching intentionally, since very low leaching can accelerate pH rise in high-alkalinity systems, while excessive leaching wastes inputs and can create uneven nutrient distribution.

When these practices are in place, chlorosis becomes the exception rather than the routine. Growers typically see more uniform crops, fewer rescue chelate drenches, improved scheduling, and lower labor and input costs during production and finishing.

Even with strong prevention practices, chlorosis still occurs when monitoring is inconsistent or corrective steps miss key details, so the next section highlights common mistakes that lead to recurring problems.

Common Mistakes with Iron Chelate Applications

Iron chlorosis often becomes a recurring problem when corrective procedures focus on symptoms rather than the root-zone conditions causing iron tie-up. The most common issue is applying chelated iron without first confirming substrate pH and identifying why pH is drifting upward. When the underlying driver, usually irrigation water alkalinity and inadequate acidity management, is not addressed, any improvement is often temporary.

Other frequent mistakes include using a chelate that is too weak for the measured pH, applying too little drench volume to fully wet the root ball, or treating only the surface of the container and leaving portions of the substrate untreated. In these cases, chlorosis may improve sporadically across crops or for a short period, then return as iron precipitates again.

Repeated corrective drenches without fixing the cause of pH drift increase labor and cost and can create new problems, including micronutrient imbalance or toxicity in iron-efficient crops. For foliar sprays, another common mistake is failing to manage residues: do not rinse foliage immediately after application unless the label directs it. Washing the spray off too soon reduces uptake, and uneven residues or concentrated

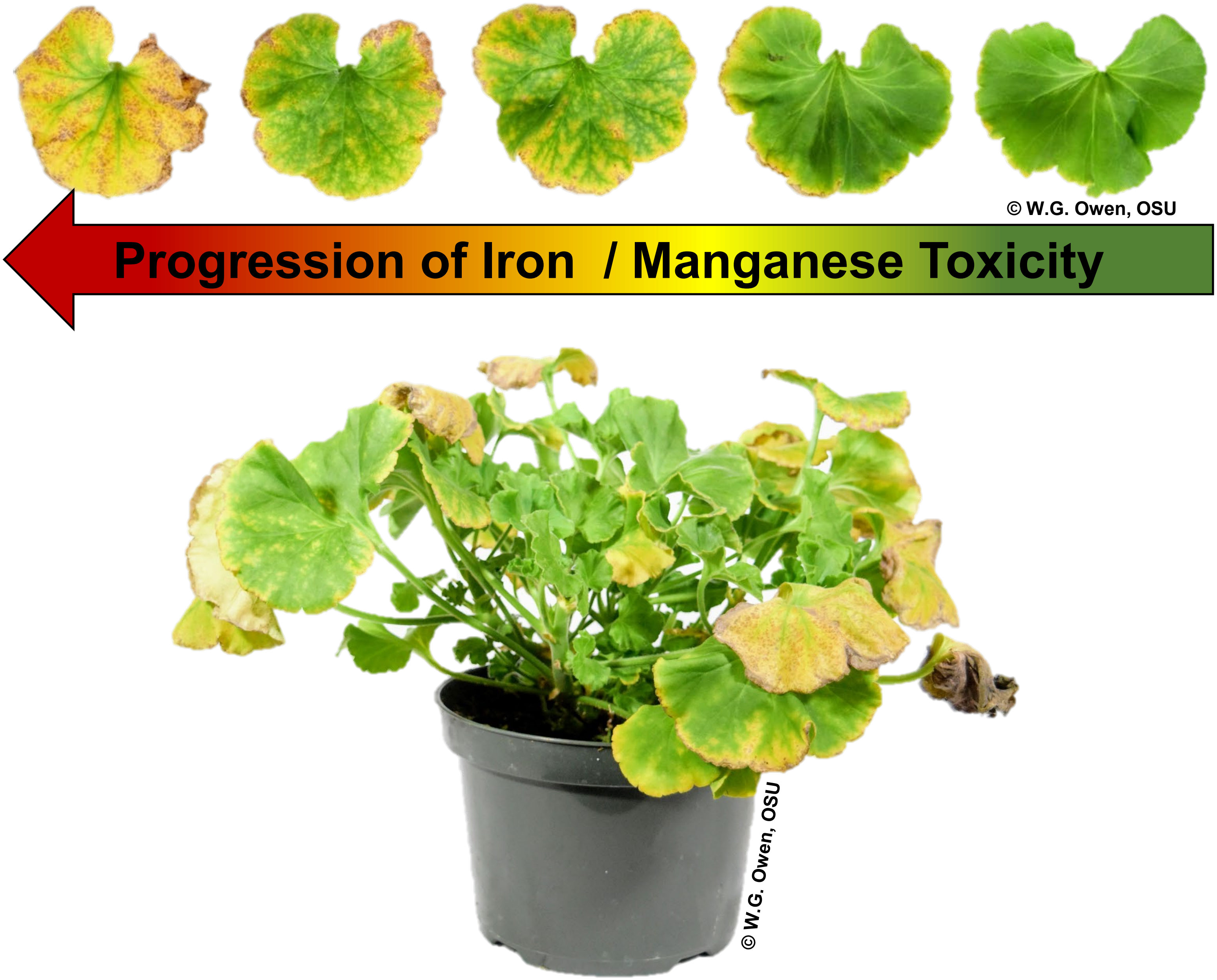

Figure 7. Example of zonal geranium exhibiting signs of iron and manganese toxicity shown as lower leaf chlorosis (yellowing), bronzing, and leaf necrosis (death) because of low substrate pH. Photos by: Dr. W.G. Owen, OSU.

droplets left behind can increase the risk of leaf spotting or burn, especially under high light or warm conditions.

Finally, do not judge success by whether severely chlorotic leaves turn green again. Those leaves often do not fully recover. Instead, evaluate success by the color and vigor of newly expanding growth and by confirming that substrate pH is moving back toward the crop’s target range.

Overall, iron chlorosis in floriculture crops is most often an availability problem driven by substrate pH and irrigation water alkalinity, not a lack of iron in the fertilizer program. Consistent control begins with measuring substrate pH, managing irrigation water alkalinity, and keeping crops within their target pH range. When correction is needed, match iron chelate strength to measured pH, apply corrective drenches uniformly to fully wet the root ball, and evaluate success based on greener new growth rather than recovery of old leaves. Use foliar sprays strategically for short-term appearance, but do not rely on them to solve root-zone chemistry issues. When monitoring, iron chelate selection, and application practices are aligned, iron chlorosis becomes predictable, preventable, and far less disruptive to crop quality and scheduling. A one-page table is provided on the following page to help with iron-chelate selection and outlining considerations.

Iron Chelate Selection & Use Guide

Choosing Fe-EDTA, Fe-DTPA, and Fe-EDDHA for soilless greenhouse crops

(1) Select the Iron Chelate

Substrate pH	Most reliable Fe-chelate	Notes
5.4 to 6.2	Fe-EDTA	Best for prevention when pH is in-range; most economical.
6.2 to 6.8	Fe-DTPA	Best option as substrate pH drifts upward; pair with pH management.
6.8 to 7.2	Fe-DTPA or Fe-EDDHA	If chlorosis is active on iron-inefficient crops, EDDHA is usually more consistent.
> 7.2	Fe-EDDHA	Most dependable at high pH; expect staining; avoid overuse when pH is low.

Crop Risk Reminders

Iron-inefficient crops: quick to develop interveinal chlorosis (yellowing) as substrate pH rises. Examples: calibrachoa, petunia, pansy, & snapdragon.

Iron-efficient crops: higher iron / manganese toxicity risk at low substrate pH. Examples: zonal geranium, lisianthus, & marigolds.

(2) Quick Mixing Guide

Chelate	% Fe	ppm Fe from 1 oz/ 100 gal	oz /100 gal for 30 ppm Fe
Fe-EDTA	13%	9.75	3.1
Fe-DTPA	11%	8.25	3.6
Fe-EDDHA	6%	4.50	6.7

Benchmark:

60 ppm Fe is about 6.1 oz Fe-EDTA (13% Fe) or 7.3 oz Fe-DTPA (11% Fe) per 100 gal (about 8.0 oz if DTPA is 10% Fe). Verify product analysis.

(3) Application Guide

Best Practices

- Measure substrate pH and document trend.
- Correct the cause of high substrate pH, i.e., irrigation water alkalinity, fertilizer selection, low leaching, excessive limestone addition, etc.
- Apply iron chelates to the root-zone and rise foliage and flowers if solution contacts plant parts.
- Recheck substrate pH and evaluate new growth for green color in 3 to 7 days.

Practices to Avoid

- Do not use iron sulfate as a foliar spray.
- Do not keep reapplying iron chelate if substrate pH remains high.
- Do not apply Fe-EDDHA when substrate pH is already low; micronutrient toxicity risk increases.
- Do not assume all chelates are interchangeable; dose varies with Fe % and chelate form.

Troubleshooting Tip:

If substrate pH is in-range but chlorosis (yellowing) persists, consider root health, cold/wet substrate, high soluble salts [referred to as electrical conductivity (EC)], excess phosphorus, or micronutrient interactions before increasing iron.

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