e-GRO Alert
Volume 3, Number 21 March 2014

by Roberto G. Lopez
rglopez@purdue.edu

Correctly Applying Iron Chelates – Avoiding the Burn

Once you have applied a substrate drench of iron chelate to your crop, immediately rinse off the foliage and flowers with clear water to ensure that the concentrated iron is removed.

American Floral Endowment
2014 Sponsor

Iron deficiencies in greenhouse crops are more common than you might think, especially on iron-inefficient vegetatively propagated annuals. The deficiencies first appear as an interveinal chlorosis of the youngest leaves (Figure 1). If left untreated, the chlorosis associated with high substrate pH in iron-inefficient plants can progress from the growing tip to the older foliage. Plants will eventually become stunted, and necrotic. It is estimated that iron deficiencies lead to 5% shrink in profits for the greenhouse industry. Simple prevention, diagnosis, and cautious corrective measures can eliminate shrink associated with iron deficiencies.

Iron (Fe) is needed to make the green pigment, chlorophyll which gives plants their green color. When iron-inefficient plants are grown under high substrate pH (>6.2), iron is not taken up by the roots. Iron, a micronutrient is more soluble in a substrate with low pH. Plants that fall

Figure 1. Interveinal chlorosis is a sign of an iron deficiency in calibrachoa (top left), chasmanthium (top right), and diascia which are considered iron-inefficient crops (bottom).

e-GRO Alert

www.e-gro.org

CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension - Suffolk County
nora.catlin@cornell.edu

Dr. Kristin Getter
Floriculture Outreach Specialist
Michigan State University
getterk@msu.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension - Suffolk County
dog1@cornell.edu

Dr. Brian Krug
Floriculture Ext. Specialist
Univ. New Hampshire
brian.krug@unh.edu

Dr. Joyce Latimer
Floriculture Extension & Research
Virginia Tech
jlatime@vt.edu

Dr. Roberto Lopez
Floriculture Extension Specialist & Research
Purdue University
rglopez@purdue.edu

Dr. Paul Thomas
Floriculture Extension & Research
University of Georgia
pathomas@uga.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

under the "iron-inefficient" or "petunia group" include: bacopa, basil, brachycome, calibrachoa, chasmanthium (northern sea oats), diascia, nemesia, osteospermum, pansy, petunia, scaevola, snapdragon, and vinca. These crops should be grown in a substrate pH of 5.4 to 6.2 and should be monitored regularly. If you continuously have difficulty with iron chlorosis on iron-inefficient crops, acidification of your irrigation water may be necessary. For more information on acid injection, please visit the Purdue Floriculture website: flowers.hort.purdue.edu >Extension Bulletins > Alkalinity Management in Soilless Substrates. If acid injection is not possible in your facility, consider using a highly acidic fertilizer or a fertilizer labelled for petunias or iron inefficient crops.

Before attempting to correct any deficiency symptom, first send in tissue samples of the affected plants to a lab for confirmation. Manganese and zinc deficiencies can often mimic iron deficiencies symptoms. Once you have confirmed that your crop is deficient in iron, you may apply a substrate drench of iron chelate (ie. Fe-EDDHA or Fe-DTPA) according to the product label. If the symptoms are not severe, you should see an improvement (ie. greening of the foliage) within a few days as iron chelates are fast acting. Plants that exhibit severe chlorosis may require a second application of Fe-EDDHA especially if the pH > 6.5 as it is soluble across a wide pH range.

Remember that iron chelates should never be applied to "iron-efficient" or "geranium group crops" such as geraniums (seed and zonal), lisianthus, marigolds, and New Guinea impatiens) as iron toxicities can occur. These crops should be grown at a pH of 6.0 to 6.5 to avoid iron/ manganese toxicity.

The take-home message

Once you have applied a substrate drench of iron chelate to your crop, immediately rinse off the foliage and flowers with clear water to ensure that the concentrated iron is removed. Iron phytotoxicity can cause a wide variety of symptom depending on the species. For example, leaf tip burn or necrosis is often observed in vinca (Figure 2). Symptoms of iron burn can slowly progress brown speckling or spots to large necrotic lesions or senesced foliage as observed on this petunia crop (Figure 3). Begonia leaves are very sensitive and symptoms can appear within 12 hours and progress to complete leaf senescence within a few days

Cooperating Universities

Cornell University Cooperative Extension of Suffolk County

PURDUE UNIVERSITY

THE UNIVERSITY OF GEORGIA COOPERATIVE EXTENSION
College of Agricultural and Environmental Sciences
College of Family and Consumer Sciences

NC STATE UNIVERSITY
Floriculture

VirginiaTech
Invent the Future

MICHIGAN STATE UNIVERSITY

UNIVERSITY of NEW HAMPSHIRE
Cooperative Extension

In cooperation with our local and state greenhouse organizations

Indiana FLOWER GROWERS Association

Metropolitan Detroit Flower Growers Association

Virginia Flower Growers Association Since 1954

lifga

NC FLOWER POWER

NEW HAMPSHIRE Plant Growers
QUALITY GARDEN CENTERS & GROWERS

(Figure 4). Therefore, foliar applications of iron chelates should be avoided. Note that the iron deficiency symptoms were eliminated in all the above examples with a single iron chelate application, but the crops are now unsalable due to the phytotoxicity!

Do not confuse foliage iron burn for other issues. Severe thrips damage and necrosis from downy mildcan often mimic foliar iron phytotoxicity symptoms (Figure 5).

Figure 2. Iron chelate phytotoxicity appears as dark leaf necrosis on vinca.

Figure 3. Iron chelate phytotoxicity progresses from speckling (left) to severe leaf necrosis (right) in petunia.

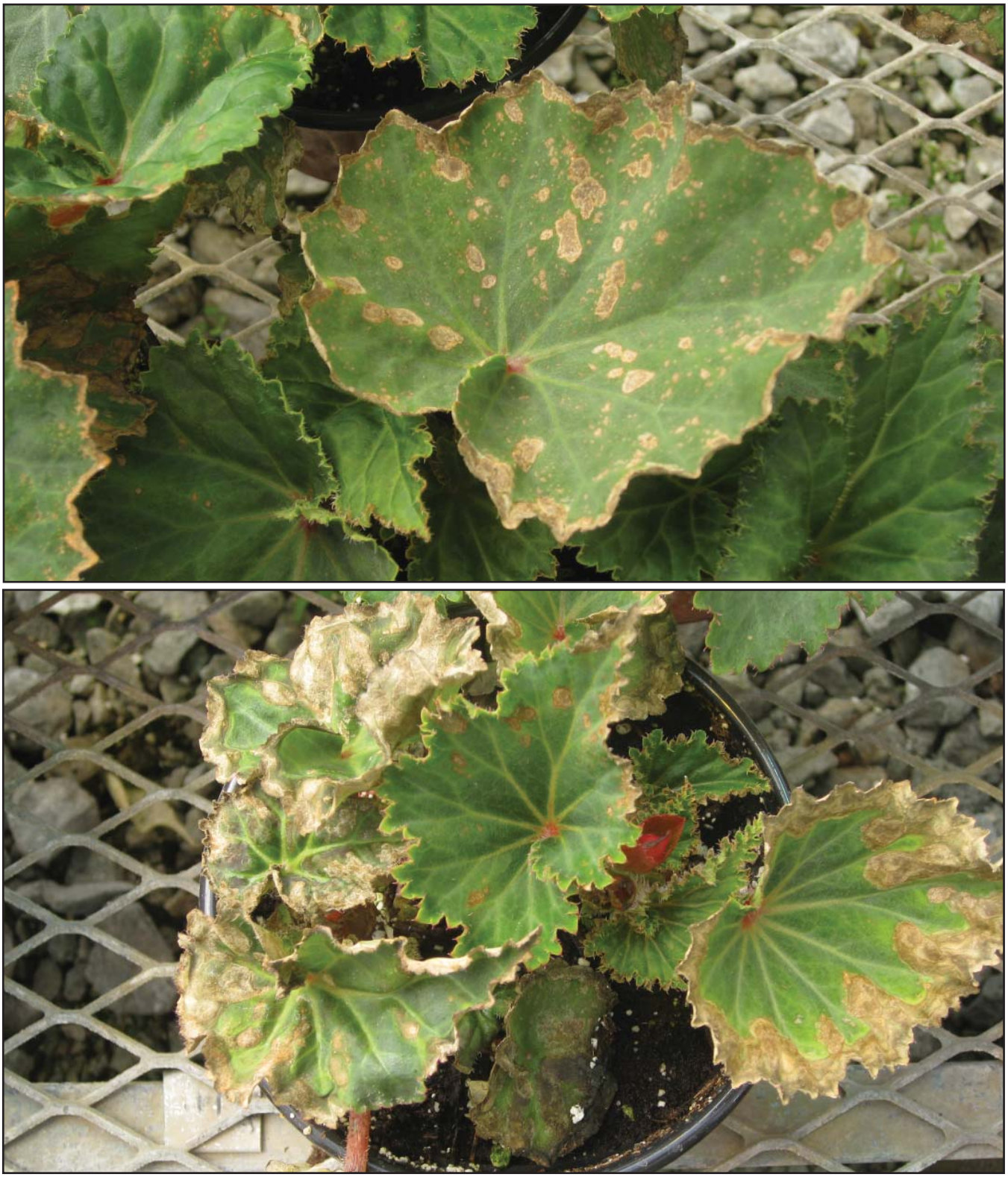

Figure 4. Begonias are especially sensitive to concentrated foliar iron phytotoxicity. Speckling can be observed within 12 hours (top) and leaf necrosis and senescence can occur within a few days. (bottom)

Figure 5. Severe thrips damage (top left) and downy mildew symptoms (bottom) can mimic foliar iron chelate phytotoxicity.