e-GRO Nutritional Monitoring

Brian E. Whipker[1] Paul Cockson[1] Josh B. Henry[1] W. Garrett Owen[2]

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Nutritional Monitoring Series

Ipomoea

(Ipomoea batatas)

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Ipomoea *(Ipomoea batatas)* also known as the sweetpotato vine, are grown both as a food crop and an ornamental. Ipomoea plants require medium fertility levels between 150 to 200 ppm N. Optimal substrate pH values for ipomoea are from 5.8 to 6.2. Substrate pH values below 5.5 can lead to excessive availability of micronutrients,

Figure 1. Substrate pH below 5.5 can enable excessive iron (Fe) and manganese (Mn) uptake in ipomoea *(Ipomoea batatas)* causing older developed leaves to develop a blackish-purple coloration.

Ipomoea

Target Nutrition Parameters

pH Category III:
5.5 to 6.2

Fertility Category:
Medium
150 to 200 ppm N

EC Category B:
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

[1]NC State University
bwhipker@ncsu.edu
[2]University of Kentucky
wgowen@uky.edu

Figure 2. Substrate pH above 6.5 or over irrigation can inhibit iron (Fe) uptake in ipomoea *(Ipomoea batatas)* causing newly developed leaves to become Fe-deficient and exhibit interveinal chlorosis (yellowing). Photo by: Brian Whipker.

such as iron and manganese. This excess availability will result in toxic accumulation of these elements which will develop as a blackish-purple discoloration of the lower leaves. Substrate pH values above 6.5 inhibit Fe availability and induce interveinal chlorosis of the recently matured leaves. Low substrate electrical conductivity levels will result in stunted plant growth, lower leaf pale coloration, and leaf loss.

Fertility Management of Ipomoea

Ipomoea cuttings should be grown with a pH range of 5.8 to 6.2. Ipomoea are susceptible to low pH induced iron and manganese toxicities. Therefore, the lower pH boundary is 5.8. Generally lower leaf blackish-purple discoloration (Fig. 1) due to acidic conditions will occur at pH values less than 5.5. Above pH 6.5, iron (Fe) can become limiting and leads to interveinal chlorosis of the younger growth. High substrate pH above 6.5 can inhibit Fe uptake causing newly developed leaves to develop interveinal chlorosis (Figs. 2 and 3). Corrective procedures for high substrate pH should begin within the range of 6.3 to 6.5.

Use recommended 1:2 Extraction, SME, or PourThru methods to determine and monitor substrate pH and soluble salts [referred to as electrical conductivity (EC)]

Figure 3. A close up view of an ipomoea *(Ipomoea batatas)* leaf exhibiting extensive interveinal chlorosis (yellowing). Photo by: Brian Whipker.

values. Additionally, conduct routine foliar analysis tests to monitor crop nutrient status. Tissue nutrient levels found in healthy, newly expanded leaves of ipomoea are not available in the literature. Monitoring substrate pH and nutrient status will enable growers to avoid pH induced nutritional disorders.

After ipomoea plugs or liners are transplanted, providing medium fertility of 150 to 200 ppm N is recommend during vegetative growth phase. Fertilize at every other irrigation with 150 to 200 ppm N delivered from 20-10-20, alternating with 14-0-14.

Insufficient fertility levels (low EC) will result in stunted growth (Fig. 4) and lower leaf pale coloration and chlorosis (yellow; Fig. 5). Leaf loss also occurs with advanced symptomology (Fig. 6).

High EC can cause stunted plant growth and lower leaf necrosis (Fig. 7). Routinely check substrate EC and maintain below 0.9, 2.0, or 3.0 mS/cm, based on the 1:2 Extraction, SME, or PourThru methods, respectively.

Summary

Providing ipomoea with a moderate level of fertility ranging from 150 to 200 ppm N and maintaining a substrate pH of 5.8 to 6.2 will prevent most nutritional disorders from occurring.

Literature Cited

Whipker, B. 2013. Ipomoea. e-GRO Diagnostic Series: #8. p.155.

Figure 4. Providing insufficient fertility [low electrical conductivity (EC)] during ipomoea *(Ipomoea batatas)* production can result in stunted plant growth. Photo by: Brian Whipker.

Figure 5. Providing insufficient fertility [low electrical conductivity (EC)] during ipomoea *(Ipomoea batatas)* production can result in lower leaf pale coloration and chlorosis (yellowing). Photo by: Brian Whipker.

Figure 6. Insufficient fertility [low electrical conductivity (EC)] during ipomoea *(Ipomoea batatas)* production can cause lower leaves to drop. Photo by: Brian Whipker.

Figure 7. Excessive fertility [high electrical conductivity (EC)] during ipomoea *(Ipomoea batatas)* production can cause stunted growth and lower leaves to necrosis. Photo by: Brian Whipker.

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 ($KHCO_3$) 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 ($KHCO_3$)

- 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

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Nick Flax
Commercial Horticulture Educator
Penn State Extension
nzf123@psu.edu

Thomas Ford
Commercial Horticulture Educator
Penn State Extension
tgf2@psu.edu

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

Dr. Joyce Latimer
Floriculture Extension & Research
Virginia Tech
jlatime@vt.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
Greenhouse Extension & Research
University of Kentucky
wgowen@uky.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.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
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

Cooperating Universities

Cornell University

Cornell Cooperative Extension Suffolk County

Iowa State University

University of Kentucky

PennState Extension

Virginia Tech

Michigan State University

UCONN

Purdue University

The University of Georgia

NC State University

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U of A Division of Agriculture Research & Extension University of Arkansas System

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