



Brian Whipker, Patrick Veazie, David Logan, and M. Seth Ballance<sup>1</sup>

W. Garrett Owen, W. Ty Rich, and Lauren Seltsam<sup>2</sup>

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# Coleus Nutritional Disorder Guide

*This e-GRO Alert provides a photographic guide to coleus nutritional disorders.*

Coleus are popular bedding plants because of their foliage which are available in a wide assortment of colors and leaf shapes. Successful production of coleus requires knowledge of the disorders that can affect plant growth. This e-GRO Alert focuses on coleus nutritional disorders.

Both high and low substrate pH and high and low substrate electrical conductivity (EC) are the four primary nutritional disorders reported. e-GRO authors have conducted research trials that have induced a number of additional nutritional disorders.

e-GRO authors have published detailed pH and EC recommendations for coleus (e-GRO Nutritional Monitoring 3-10).



Figure 1. Upper leaf interveinal chlorosis can occur when the substrate pH is higher than the optimal range. (Photo: Brian Whipker)

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*COVID-19 protocols caused uncertainty about our ability to conduct research. This research project provided an opportunity to enjoy exploring coleus production as a joint University of Kentucky and North Carolina State University endeavor.*

<sup>1</sup>NC State University, Dept. of Hort. Science  
[bwhipker@ncsu.edu](mailto:bwhipker@ncsu.edu)

<sup>2</sup>University of Kentucky, Dept. of Hort.  
[wgowen@uky.edu](mailto:wgowen@uky.edu)

## High pH

High substrate pH in coleus can induce interveinal chlorosis of the upper foliage (Fig. 1). This is the result of iron, provided by fertility and in the substrate, being unavailable for plant uptake. Any factor that negatively affects root development, such as root rot, cold growing, or overly saturated substrate conditions, can also develop into interveinal chlorosis of the upper foliage. The recommended substrate pH range for coleus is between 5.5 and 6.2.

## Low pH

Low substrate pH can induce iron (lower leaf bronzing) or manganese (lower leaf black spotting) toxicity in many species. Even if visual symptoms are not observed, the stunting of plant growth can occur as we found with coleus (Fig. 2). To avoid affecting plant growth, maintain the substrate pH between 5.5 and 6.2.

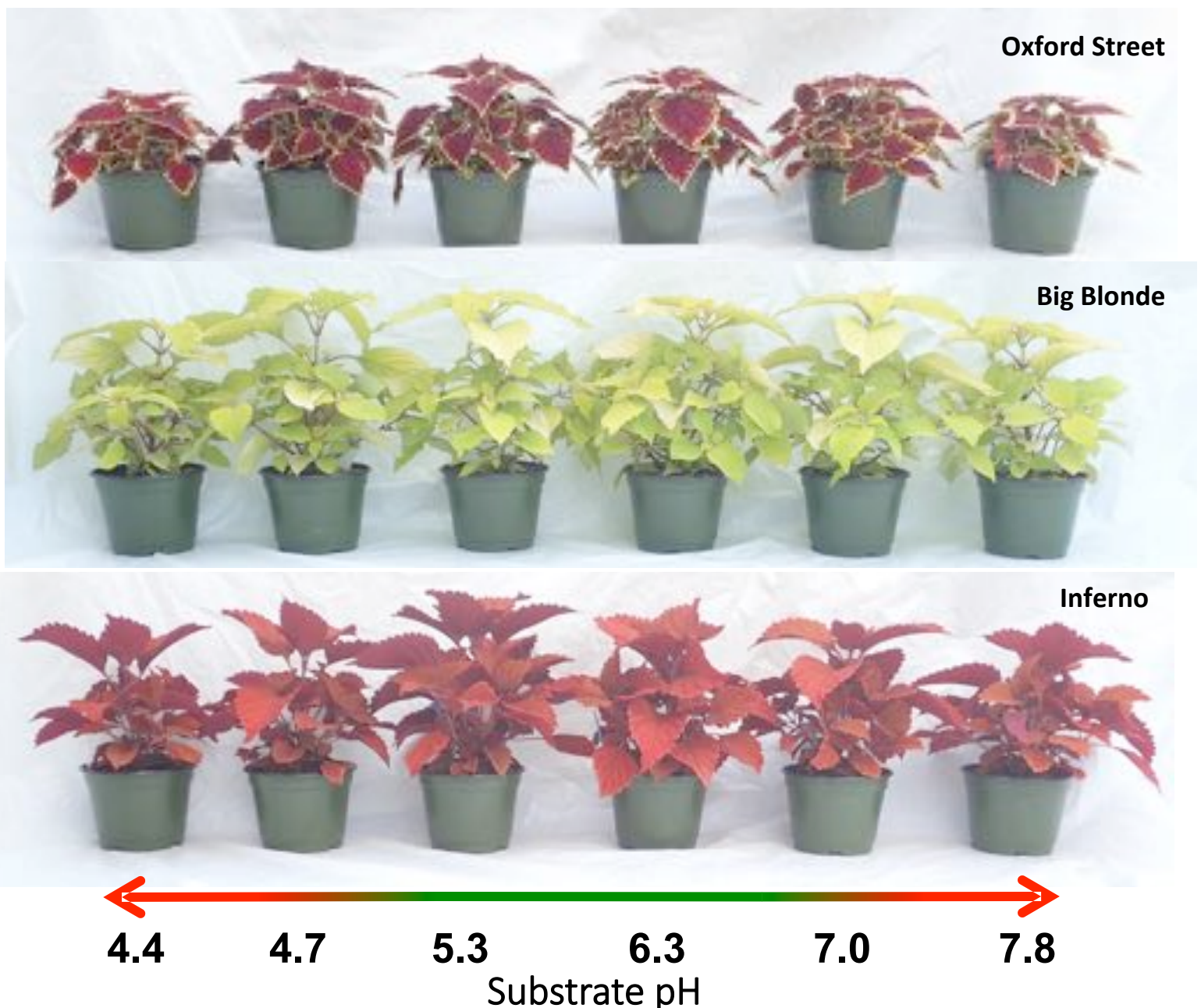


Figure 2. Stunted plant growth can occur with coleus if the substrate pH is lower than the optimal range. (Photo: Brian Whipker)

### High EC

High substrate electrical conductivity (EC) commonly occurs when excessive fertilization rates are provided to the plant. Lower leaf marginal necrosis is the typical symptomology (Fig. 3). Monitoring the substrate pH levels will help ensure that your crop is growing within the recommended parameters.



Figure 3. Lower leaf overall necrosis and stunted growth can occur when the substrate electrical conductivity (EC) levels are too high.

### Low EC

Low substrate electrical conductivity (EC) is commonly observed with coleus. Insufficient nitrogen (N) fertilization is the primary cause. Lower leaf yellowing and stalled growth are both typical symptoms (Fig. 4). Fertilizing plants with around 150 ppm N should provide adequate levels of fertility.



Figure 4. Lower leaf overall chlorosis and stunting can occur when the substrate electrical conductivity (EC) levels are too low. A comparison of 'normal' growth (left) versus a plant growth grown under low EC levels (right) is provided. (Photos: top - Brian Whipker and bottom - W. Garrett Owen)



## N, P, and K Deficiencies

Deficiencies of N, phosphorus (P) and potassium (K) all result in stunted growth (Fig. 5). The most dramatic stunting occurs with limited N, while limited P resulted in more spindly growth, and low K resulted in a compact plant that still retained overall plant quality. Ultimately, the lack of providing K negatively affected plant quality and resulted in the typical downward turned umbrella-shaped leaves (Fig. 6).

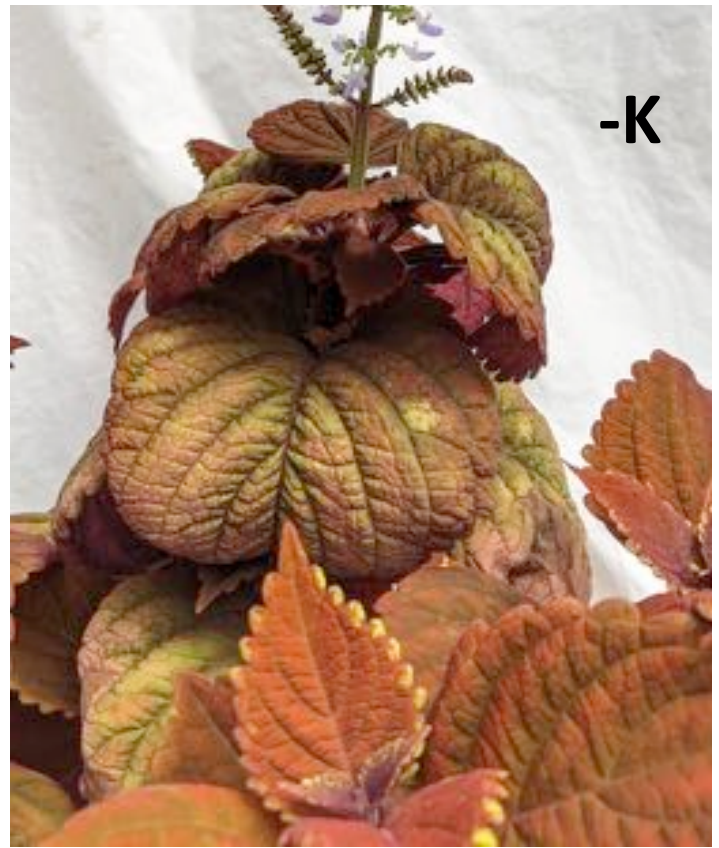


Figure 6. Coleus plants grown without potassium (K) ultimately develop downward oriented leaves. (Photo: Brian Whipker)

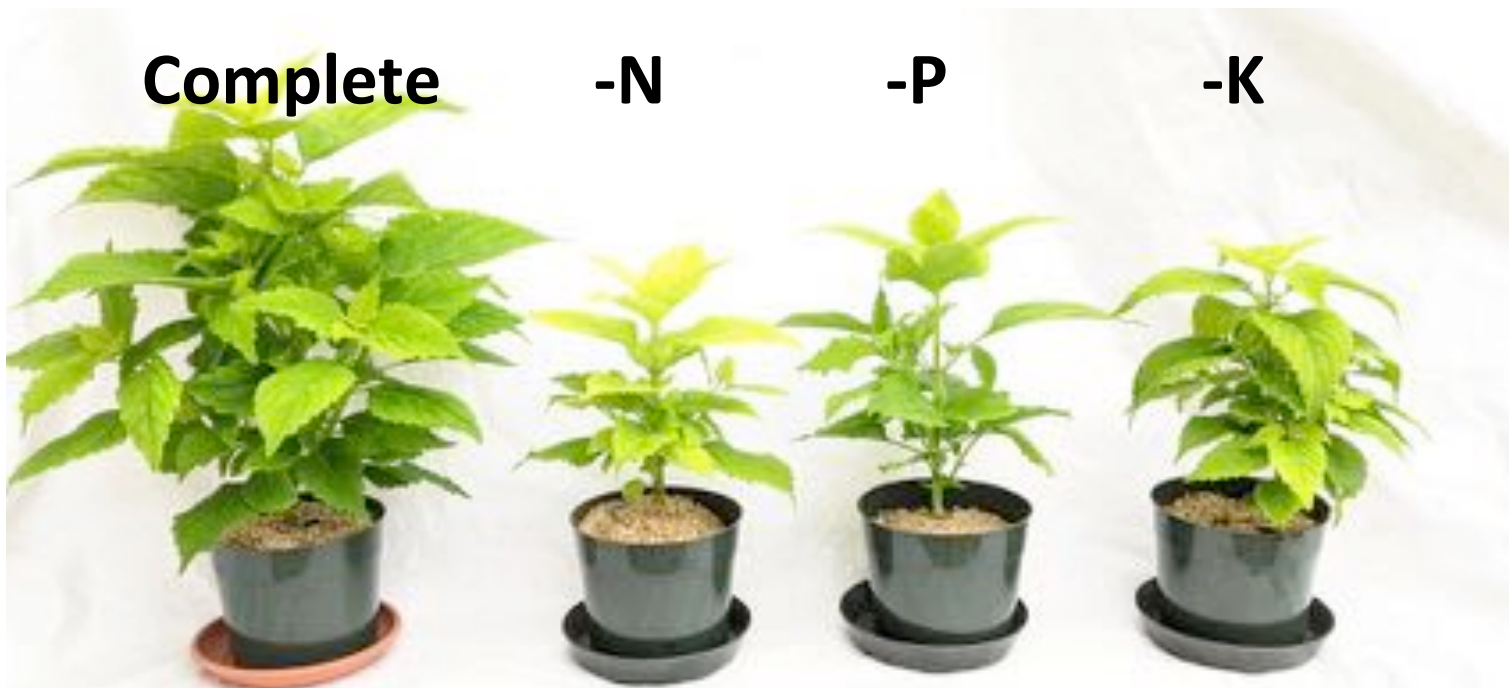


Fig. 5. Comparison of plants grown with a complete compliment of nutrients (left to right), to nitrogen (N), phosphorus (P), and potassium (K) deficiencies on plant growth. (Photo: Brian Whipker)

### Low Ca

Most substrates contain limestone which provides a baseline level of calcium (Ca) to coleus plants. In areas not over limestone bedrock, the amount of Ca in the substrate diminishes over time and can lead to necrosis of the new leaves when it is deficient (Fig. 7).



Figure 7. Necrosis of the new growth occurs when calcium (Ca) is deficient. (Photo: Brian Whipker)

### Low Mg

Magnesium (Mg) deficiencies are less common in coleus, but can occur. The typical interveinal chlorosis of the lower foliage occurs when Mg is limited (Fig. 8).



Figure 8. Lower leaf chlorosis occurs when magnesium (Mg) is limited. (Photo: W. Garrett Owen)

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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  
Greenhouse Horticulture and  
Controlled-Environment Agriculture  
University of Arkansas  
[ryand@uark.edu](mailto:ryand@uark.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. Chieri Kubota  
Controlled Environments Agriculture  
The Ohio State University  
[kubota\\_10@osu.edu](mailto:kubota_10@osu.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  
Greenhouse Extension & Research  
University of Kentucky  
[wgowen@ukv.edu](mailto:wgowen@ukv.edu)

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

Dr. Alicia Rihn  
Agricultural & Resource Economics  
University of Tennessee-Knoxville  
[arihn@utk.edu](mailto:arihn@utk.edu)

Dr. Debalina Saha  
Horticulture Weed Science  
Michigan State University  
[sahadeb2@msu.edu](mailto:sahadeb2@msu.edu)

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

Dr. Jean Williams-Woodward  
Ornamental Extension Plant Pathologist  
University of Georgia  
[jwoodwar@uga.edu](mailto:jwoodwar@uga.edu)

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