

Rosa E. Raudales  
rosa@uconn.edu



Mayra Toro-Herrera  
mayra.toroh@uconn.edu

Volume 14 Number 37 October 2025

## Application Timing of PGRs affects Plug Outcomes

*In this Alert, we present research where we evaluated the application timing to apply Sugar Mover®, an EPA-registered plant growth regulator that contains cytokinin, boron, and molybdenum, on rooting of coleus.*

### Rooting in Coleus

The success of vegetative propagation depends heavily on fast, uniform rooting. Strong roots are the foundation for healthy plants, but it is easy to forget how much the timing of inputs affects that process.

In our recent study published in HortScience, we set out to answer a simple but important question: When is the best time to apply Sugar Mover®. Sugar Mover® is an EPA-registered plant growth regulator that contains cytokinin, boron, and molybdenum.



Coleus unrooted cutting at arrival.

We already know that cytokinin and certain micronutrients can influence rooting and carbohydrate movement, but in order to achieve optimum results considering developmental timing is important. We wanted to see whether applying this product early, mid-way, or late in the rooting process would make a measurable difference in how roots form and grow.

### 2025 Sponsors



American  
Floral  
Endowment

Research  
Internships  
Scholarships  
Education

Funding the Future of Floriculture

Ball®

fine



JR PETERS  
LABORATORY  
THE SCIENCE BEHIND BETTER PLANT PERFORMANCE



GRIFFIN  
GREENHOUSE & NURSERY SUPPLIES



P.L. LIGHT SYSTEMS  
THE LIGHTING KNOWLEDGE COMPANY

Reprint with permission from the author(s) of this e-GRO Alert.

## Testing four rooting stages

We used coleus (*Plectranthus scutellarioides* 'Wild Lime') cuttings and applied the product into four key stages:



**Sticking** – the first 24 hours after inserting cuttings into the rooting substrate

**Callus formation** – when a white, swollen area develops at the cut surface before roots are visible (5 days after sticking)

**Root expression** – when roots first emerge and elongate (8 days after sticking)

**Toning** – when roots reach the edge of the tray and the plugs are nearly ready for transplant (22 days after sticking)

We applied the product once at each of these stages and compared them with untreated controls. All plants were grown under typical greenhouse conditions and harvested 29 days after sticking.

## What we found

**1. Early applications can do more harm than good.** When the product was applied right after sticking, the cuttings performed the worst. They showed shorter roots and shoots, lower dry weight, and mild phytotoxic effects.

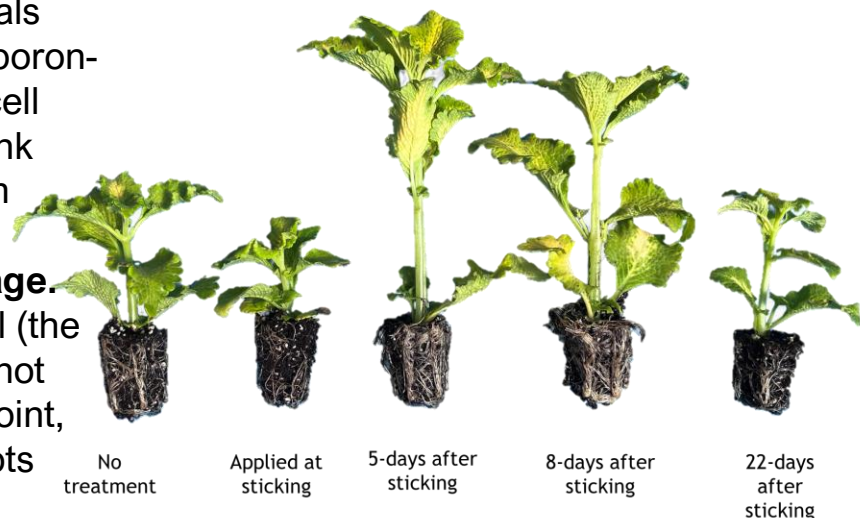
**2. Applying during callus or initial root expression boosted early root development.**

When applied at the callus stage or when the roots are beginning to emerge, the treatment improved total root length and root dry weight.

This makes sense—by this time, root initials are being established, and the cytokinin-boron-molybdenum combination can enhance cell division and strengthen the developing sink tissue without interfering with hormonal m balance.

**3. Late applications offered no advantage.**

Once roots had already filled the plug cell (the toning stage), additional applications did not provide any noticeable benefits. At that point, the plant's internal balance between shoots and roots was already established.



## Why this matters

These results highlight *that application timing is as important as the product we select*.

Growth regulator and micronutrient products can be powerful tools but applying them too early or too late can waste product or even slow rooting.

In our coleus trials, applying the product during callus formation or early root expression consistently gave the best results in terms of biomass and sugar contents. However, the plug quality was a elongated which is not optimum for shipping or transplant purposes. It might be interesting to evaluate if the use of this product reduces production time, as it did with lettuce production on another one of our projects (DOI: [10.21273/HORTSCI18281-24](https://doi.org/10.21273/HORTSCI18281-24)).

**The message is simple: don't just think about what you apply—think about *when* you apply it.**

The use of brand names and/or any mention or listing of specific commercial products or services herein is solely for educational purposes and does not imply endorsement by the University of Connecticut or the author, nor discrimination against similar brands, products or services not mentioned.

## Full text of original research:

Toro-Herrera, M. A. & Raudales, R. E. (2024). The Application Timing of a Cytokinin B-Mo-based Product Affects the Characteristics of Rooted Cuttings and Nonstructural Carbohydrates of Coleus (Plectranthus scutellarioides cv. Wild Lime) during Adventitious Root Development. *HortScience*, 59(6), 840–848. <https://doi.org/10.21273/HORTSCI17756-24>

We thank the United States Department of Agriculture (USDA)-Agricultural Research Service (ARS) Floriculture and Nursery Research Initiative (Project No. 5082-21000-018-00D) and partners of the Root Alliance for supporting this research.

**e-GRO Alert**

[www.e-gro.org](http://www.e-gro.org)

**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)

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  
[rglopez@msu.edu](mailto:rglopez@msu.edu)

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

Dr. W. Garrett Owen  
Sustainable Greenhouse & Nursery  
Systems Extension & Research  
The Ohio State University  
[owen.367@osu.edu](mailto:owen.367@osu.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  
Extension Plant Pathologist  
University of Wyoming  
[jwilwood@uwyo.edu](mailto:jwilwood@uwyo.edu)

Copyright ©2025

Where trade names, proprietary products, or specific equipment are listed, no discrimination is intended and no endorsement, guarantee or warranty is implied by the authors, universities or associations.

**Cooperating Universities**



**In cooperation with our local and state greenhouse organizations**



Metro Detroit Flower Growers Association

