Potentially prolonging the shelf life of annual bedding plants with Alesco Preliminary results



Experimental Protocol



Cro

<u>Trea</u> 1. 2. 3.

2. 3. 4. 5. Ρ 6. P

Cathy Whitman, Yujin Park, Nate DuRussel, and Erik Runkle, Michigan State University

Alesco (from Chrysal)

- STS product registered in 35 States (May 2019)
- Conditioner for ethylene-sensitive potted plants like campanula, calathea, dahlia, dianthus, hibiscus, impatiens, lobelia, pansy, pelargonium, petunia, rhipsalidopsis, rose, schlumbergera and zygocactus
- Spray application: 1 ml/L until run-off, 1-2 days before shipping
- Plants should not be placed in direct sunlight during application or before the leaves are dry

Calibrachoa 'Uno Raspberry Star'

Geranium 'Moxie Deep Rose'

Control

2 days of simulated retail conditions

Florel

ons

	2 days of simulated retail conditions		
<u>os studied</u> :alibrachoa 'Uno Raspberry Star' ;eranium 'Moxie Deep Rose'	Control Florel Alesco→	Florel	
npatiens interspecific 'Bounce White' antana 'Bandana Lemon Zest' etunia 'Cascadia Bicolor Cabernet' etunia 'Easy Wave Blue'			
<u>tments</u> control /ater (2 qts/100 ft²) → Florel (100 ppm) .lesco (2 qts/100 ft²) → Florel (100 ppm)			

Alesco \rightarrow Florel

Stored in darkness for 3 days at 50 °F then in a simulated retail environment

Calibrachoa 'Uno Raspberry Star'

8 days of simulated retail conditions

Florel

Not for publication or distribution

Control

Alesco \rightarrow Florel





Controlled-Environment Lighting Lab (CELL)





Interaction of R:FR and PPFD

Seedlings grown at 68 °F for 26 days under LEDs (33 days after sow) 18-hour photoperiod









How Much FR to Accelerate Flowering?

Seedlings grown under an 18-hour photoperiod at 68 °F Antirrhinum 'Liberty Classic Yellow'





DLC Technical Requirements (v. 1.1)

Parameter/Attribute/Metric	Requirement		
Photosynthetic photon efficacy	≥1.9 µmol/J, with -5% tolerance		
Photosynthetic photon flux maintenance	Q ₉₀ ≥36,000 hours		
Driver lifetime	≥50,000 hours		
Fan lifetime	≥50,000 hours		
Warranty	5 years		
Power factor	≥0.9		
Total harmonic distortion, current (THDi)	≤20%		
Safety certification	Appropriate horticultural lighting designation by OSHA NRTL or SCC-recognized body		







Rooting Hormones

- Rooting hormones contain auxin (IAA, IBA, KIBA or NAA) that are involved in cell elongation and adventitious root formation.
- Are not required for the majority of species to achieve nearly 100% rooting success.
- Difficult- or slow-to-root species and cultivars are often treated to increase:
 - Uniformity of rooting
 - Speed of rooting
 - Root mass





Rooting Hormones

- Liquid or powder rooting hormones can be applied to the basal end of cuttings
 - Labor intensive
 - Dipping can spread diseases
- Overhead rooting hormone application after cuttings have been stuck.
- Can increase leaf yellowing by increasing the export of sugars from the leaves.



<section-header><text><text>

Erik Runkle and Cathy Whitman, MSU

Rooting Hormone Beneficial

 Species in this category will root without using rooting hormones, but will generally root faster or more uniformly with their use.

Alternathera	Gazania
Angelonia	Geranium zonal
Argyranthemum	Helichrysum
Begonia hiemalis, reinger, rex	Leucanthemum
Bougainvillea	Lobularia
Bidens	Phlox paniculata and subulata
Campanula	Poinsettia
Cuphea	Torenia
Diascia	Veronica
Fuchsia	Viola

Rooting Hormone Essential

• Species in this category are more difficult to root and there is higher value of using rooting hormones.

Rooting Hormone Essential		
Bracteantha	Hydrangea	
Calibrachoa on certain cultivars	Lantana	
Crossandra	Lobelia	
Dahlia	Mandevilla/ Dipladenia	
Dracaena	Osteospermum	
Gazania	Salvia	
Heliotrope	Regal geranium	
Hibiscus	Scaevola	
Heuchera	Thunbergia	

Spray Application after Sticking

- Can also be applied as a coarse spray over the crop that allows some of the solution to run down the stem toward the base of the cutting.
- The potassium-salt formulation of IBA is often used as it is water soluble, and therefore causes less foliar damage compared to alcohol-soluble formulations
 - 50 to 500 ppm KIBA (@ day 1 or 2 after stick)
- Some leaf curl response can occur but the plants will normally grow out of it prior to shipping.













Overhead Rooting Hormone Conclusions

- Spray applications are generally more effective than basal dip cutting applications at promoting rooting of the four species we tested.
- Generally, a low volume spray application (2 qts. per 100 ft²) at 150 to 300 ppm was effective at promoting rooting of geranium, Dahlia, and Osteospermum.

Overhead Rooting Hormone Conclusions

- Under lower light conditions (≤11 mol·m⁻²·d⁻¹), difficult to root species such as Scaevola may require a higher spray volume application.
- Daily light integral (DLI) and spray rooting hormone application interact and result in improved rooting for Scaevola and geranium.



Overhead Rooting Hormone Conclusions

• Pending EPA registration, Fine Americas will have an IBA product labeled for overhead and basal applications in 2020.



Plant Material

- Angelonia 'Big Blue' (5" pot)
- Dianthus 'Rockin Red' (6" pot)
- Hibiscus 'Berry Awesome' (2 gal.)
- Impatiens 'Bounce Cherry' (5" pot)
- Ipomoea 'Sidekick Black' (5" pot)
- Petunia 'Sumo Pink' (5" pot)
- Snapdragon 'Solstice Yellow' (5" pot)
- Verbena 'Endurascape Red' (5" pot)
- Wave Petunia 'Carmine Velour' (6" pot)

Micro drench Methods

- Application Methods: Substrate micro drench
- **Drench Volume:** sufficient volume insuring treatments are well distributed and retained entirely within the pot (3 fluid ounces per 5" and 4 fluid ounces per 6" pot)
- Number of Applications: 1 to 4









Ipomoea 'Sidekick Black' Piccolo Microdrenches (ppm) Control 0.25 0.5 1.0 2.0 Number of Applications N/A 3 3 Concise Microdrenches (ppm) 1.0 Control 0.5 0.125 0.25 Number of Applications N/A 3 3 3 2





Enhancing Color of Lettuce and Purple Fountain Grass

- 7 days of end-of-production (EOP) LED supplemental lighting (SL) providing 100 µmol·m⁻²·s⁻¹ red:blue or blue light:
 - Promotes red pigmentation of lettuce 'Cherokee' and 'Vulcan' foliage when grown under a low greenhouse DLI
- 14 days of EOP SL LED providing 100 $\mu mol^{-2\cdot s^{-1}}$ blue LED light
 - Promotes red pigmentation of purple fountain grass foliage when grown under a low greenhouse DLI





- For cabbage and kale the coloration of the foliage is often expressed in the early fall as night temperatures begin to fall below 55 to 50 °F (10 to 13 °C).
- Warm night temperatures during the fall can delay coloration of ornamental cabbage and kale:
 - Often the center is pale green to light purple foliage
 - Not as aesthetically appealing to consumers





Production Schedule

- Weekly PGR drench of 1 to 2 ppm paclobutrazol (Piccolo)
- All plants were fertilized with: 125 N/ **12 P**/ 125 K (ppm)
- After 3 weeks, ½ the plants were fertilized with: 125 N/**0 ppm P**/ 125 K (ppm)



	Production Phosphorus treatment	Cooler treatment	Light treatment	Spectral ratio (Blue:Red)
Prior-to-	P 6 weeks	Control	Control	
shipping (PTS)	P for 3 weeks/ No P 3 weeks	Control	Control	
cooling and LED Sole-source Lighting treatments in a cooler	P 6 weeks		Light- emitting diodes	100:0
	P for 3 weeks/ No P 3 weeks	40 °F (4.4 °C)		50:50
	P 6 weeks			100:0
	P for 3 weeks/ No P 3 weeks			50:50
	P 6 weeks	dioc (LEI (10 °C)		100:0
	P for 3 weeks/ No P 3 weeks		(LEDs)	50:50
	P 6 weeks		(10 °C)	
	P for 3 weeks/ No P 3 weeks			50:50

Greenhouse

PTS Treatments in a Cooler









Conclusions

- 5 to 7 days is the minimum PTS for 'Glamour Red' and 'Nagoya White'
 - Most effective treatment: Cooler set at: 40 °F (4.4 °C) under light ratio (%) 50:50 red:blue LEDs
 - Phosphorus restriction appears to influence coloration once plants are in the garden



Determining the flowering and growth responses of long-day plants under various low intensity screw-in horticulture LED lamps

> Caleb Spall, Anthony Soster, and Roberto Lopez

Department of Horticulture Michigan State University 2019

Light Quality

- Phytochrome is a major photoreceptor in plants for light quality detection
- It consists of two forms, P_R and P_{FR} , which have peak absorptions in red (670 nm) and far-red (730 nm) wavelengths of light, respectively
- Controls plant morphology in response to changes in Red to Far Red (R/FR) light ratio:

• stem extension, flowering, dormancy, tuber formation













Erik Runkle & Roberto Lopez



Photoperiodic Lamps that Work

General efficacy of different lamp types at regulating flowering. ✓ = Effective; X = Not effective. *More effective under high DLI.

Lamp type	Short-day plants	Long-day plants
Incandescent	\checkmark	\checkmark
Fluorescent (including CFLs)	\checkmark	Some*
Mix incandescent + CFL	\checkmark	\checkmark
HID (HPS, MH, Beamflicker)	\checkmark	\checkmark
White LEDs	\checkmark	Some*
Red LEDs	\checkmark	Some*
Red + far-red LEDs	\checkmark	\checkmark
Far-red LEDs	Х	Х
Blue LEDs > At low intensity	Х	Х
Green LEDs	Some	Some
Blue LEDs At moderate intensity	Not tested	\checkmark