

# Ornamental Propagation Research

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## Determining the Effectiveness of Red and Blue Light-Emitting Diodes as Supplemental Lighting during Plug Propagation

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## Background

- High-pressure sodium (HPS) lights are the current industry standard for supplemental lighting
- Light emitting diode (LED) lights provide a narrow-spectrum wavelength



## Background

- High quality bedding plant seedlings (plugs) are compact, fully rooted transplants with large stem caliper and high root and shoot dry mass



## Objectives

- To compare seedling quality under three LED supplemental lighting treatments of different light qualities to HPS lamps



## Hypothesis

- Seedlings grown under supplemental LED lights with a high R/B ratio will produce high-quality plugs earlier than plugs produced under HPS lights



## Materials and Methods

- Plant Material
  - *Antirrhinum majus* 'Rocket Pink' (snapdragon)
  - *Begonia*  $\times$ *semperflorens* 'Yang Red Green Leaf' (wax begonia)
  - *Catharanthus roseus* 'Titan Punch®' (vinca)
  - *Celosia argentea* L. var. *plumosa* L. 'Fresh Look Gold' (celosia)
  - *Impatiens walleriana* Hook. f. 'Dazzler Blue Pearl' (seed impatiens)
  - *Pelargonium*  $\times$ *hortorum* 'Bullseye Scarlet' (zonal geranium)
  - *Petunia*  $\times$ *hybrida* Vilm.-Andr. 'Plush Blue' (petunia)
  - *Tagetes patula* L. 'Bonanza Flame' (marigold)
  - *Salvia splendens* Sellow 'Vista Red' (salvia)
  - *Viola*  $\times$ *wittrockiana* Gams. 'Mammoth Big Red' (pansy)

## Materials and Methods

- (70 °F) 21 °C constant
- DLI (ambient + supplemental)  $\approx 8 - 12$  mol·m<sup>-2</sup>·d<sup>-1</sup>
- 288-cell plug tray of each species in each treatment
- Propagation treatment = 28 days

## Materials and Methods

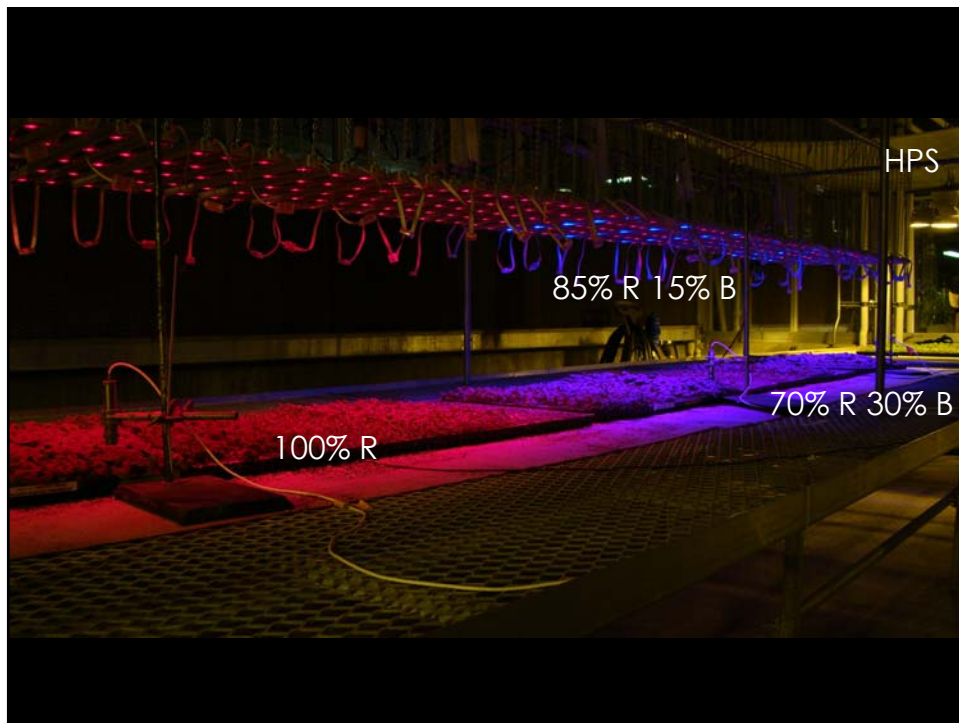
- 16-h photoperiod with the following 4 supplemental lighting treatments ( $100 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ ):

### High intensity discharge lamps (HID)

- High pressure sodium (HPS) – 150 watt

### Light emitting diodes (LEDS)

- 100 % Red LEDs (Philips Research Module)
- 85 % Red 15 % Blue LEDs (Philips)
- 70 % Red 30 % Blue LEDs (Philips)



*Catharanthus roseus*  
'Titan Punch®'

HPS

100R

85R:15B

70R:30B



*Catharanthus roseus*  
'Titan Punch®'

HPS

100R

85R:15B

70R:30B



*Celosia argentea* L.  
'Fresh Look Gold'

HPS

100R

85R:15B

70R:30B



*Celosia argentea* L.  
'Fresh Look Gold'

HPS

100R

85R:15B

70R:30B



*Impatiens walleriana* Hook. f.  
'Dazzler Blue Pearl'

HPS

100R

85R:15B

70R:30B



*Impatiens walleriana* Hook. f.  
'Dazzler Blue Pearl'

HPS

100R

85R:15B

70R:30B





*Petunia ×hybrida* Vilm.-Andr.  
'Plush Blue'

HPS

100R

85R:15B

70R:30B



*Petunia ×hybrida* Vilm.-Andr.  
'Plush Blue'

HPS

100R

85R:15B

70R:30B



*Viola ×wittrockiana* Gams.  
'Mammoth Big Red'

HPS

100R 85R:15B 70R:30B



*Viola ×wittrockiana* Gams.  
'Mammoth Big Red'

HPS

100R

85R:15B

70R:30B



## Summary

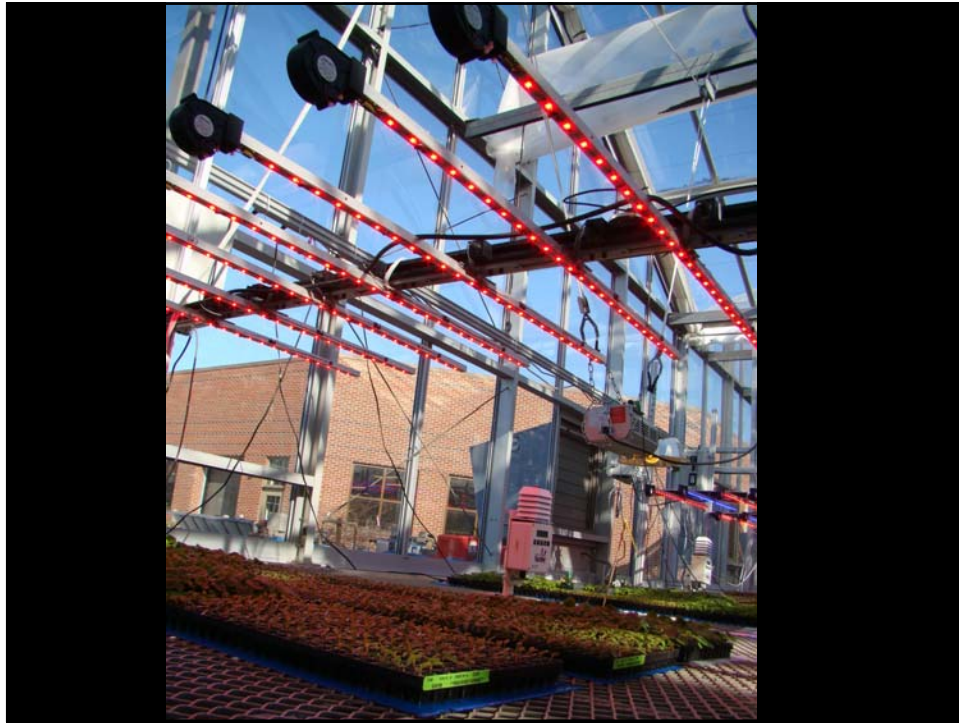
- Seedlings grown under the 85 R: 15 B LED treatment were generally of higher quality (compact, larger stem caliper, and higher chlorophyll content) than seedlings grown under HPS lamps



### Determining the Effectiveness of Red and Blue Light-Emitting Diodes and Root Zone Heating during Plug Propagation of Cold-sensitive Species

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## Materials and Methods

- (70 °F) 21 °C constant air temperature
- Ambient, + 5 and 10 °F (3 and 6 ° C) root zone temperatures
- Ambient + Supplemental DLI  $\approx 10 - 14 \text{ mol} \cdot \text{m}^{-2} \cdot \text{d}^{-1}$
- 288-cell plug tray of each species in each treatment
- Propagation treatment = 28 days

## Materials and Methods

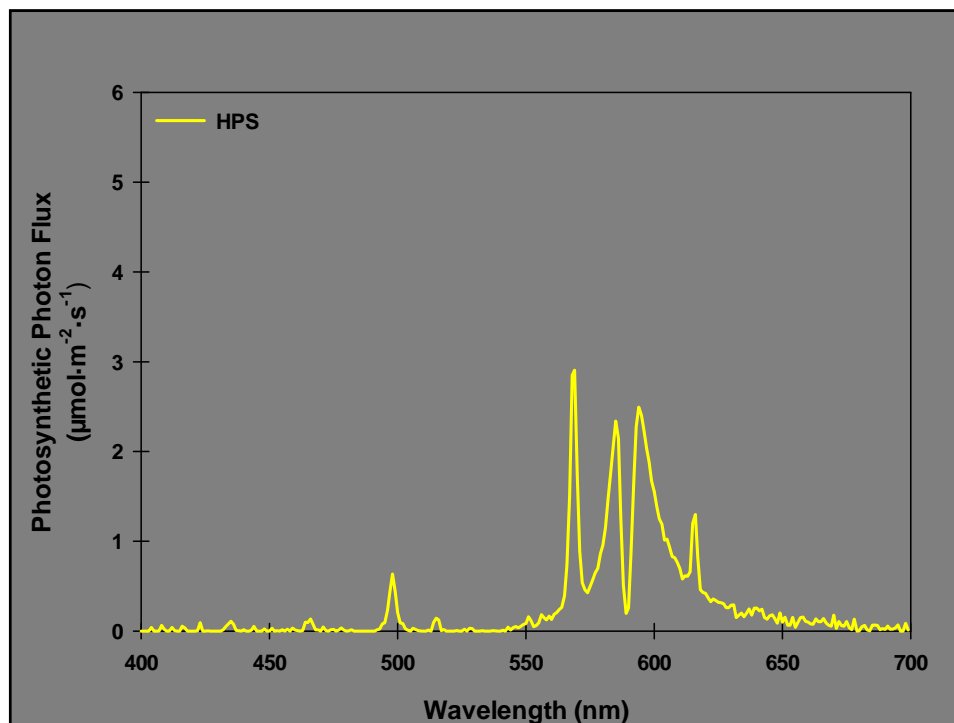
- 16-h photoperiod with the following 4 supplemental lighting treatments ( $70 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ ):

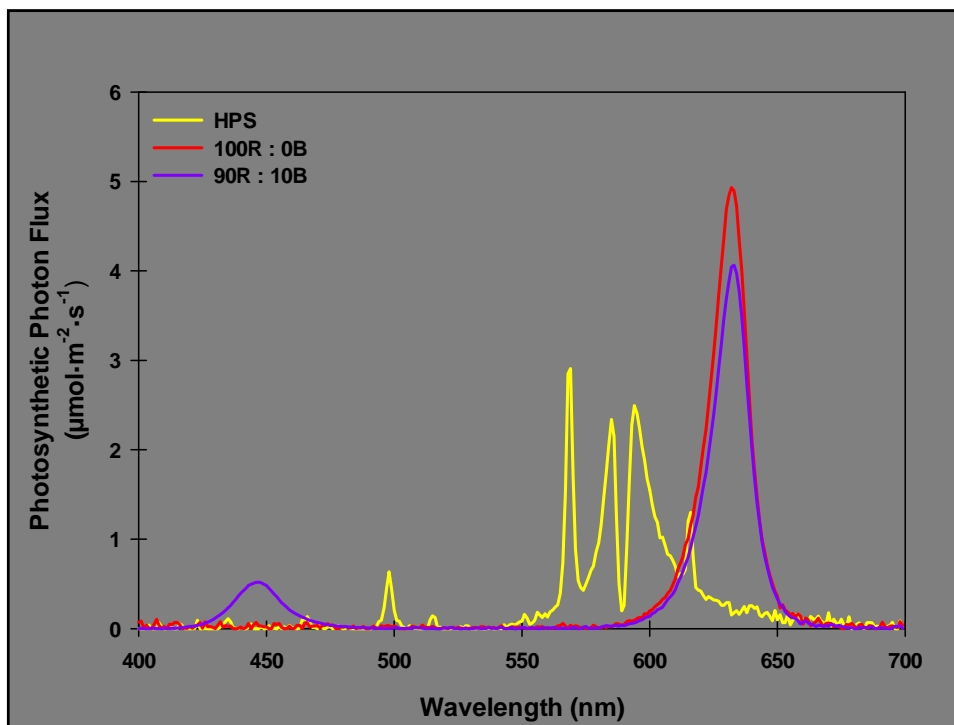
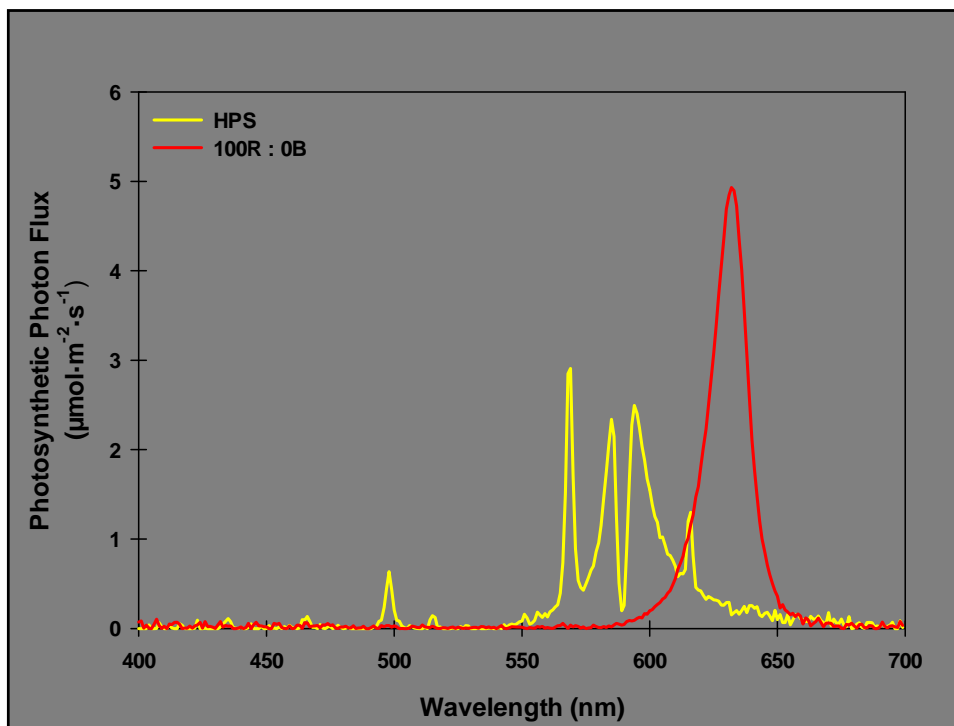
### High intensity discharge lamps (HID)

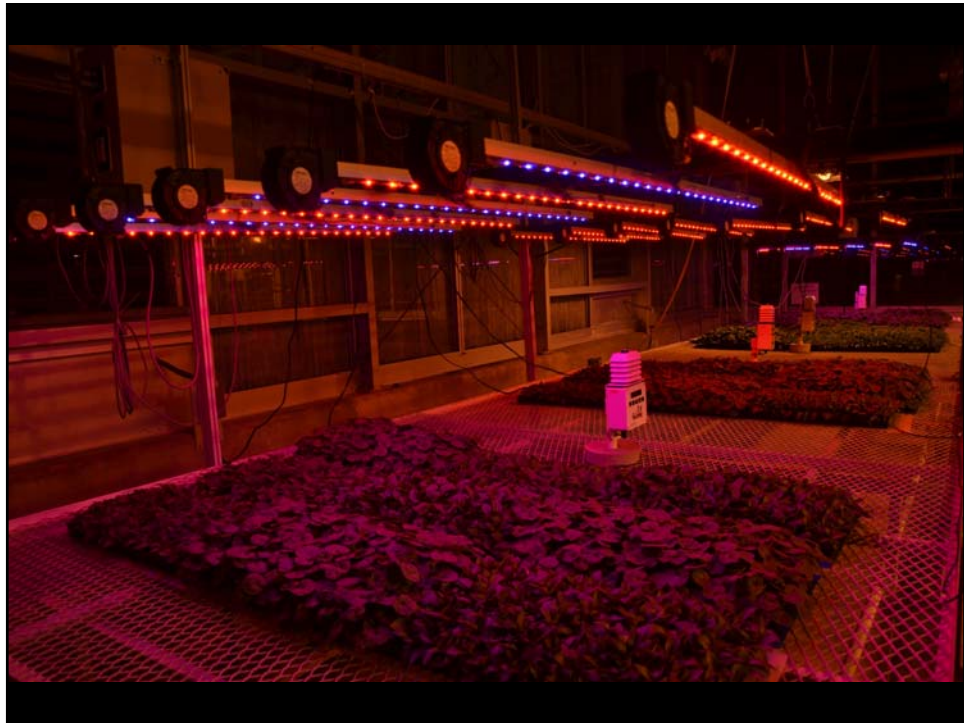
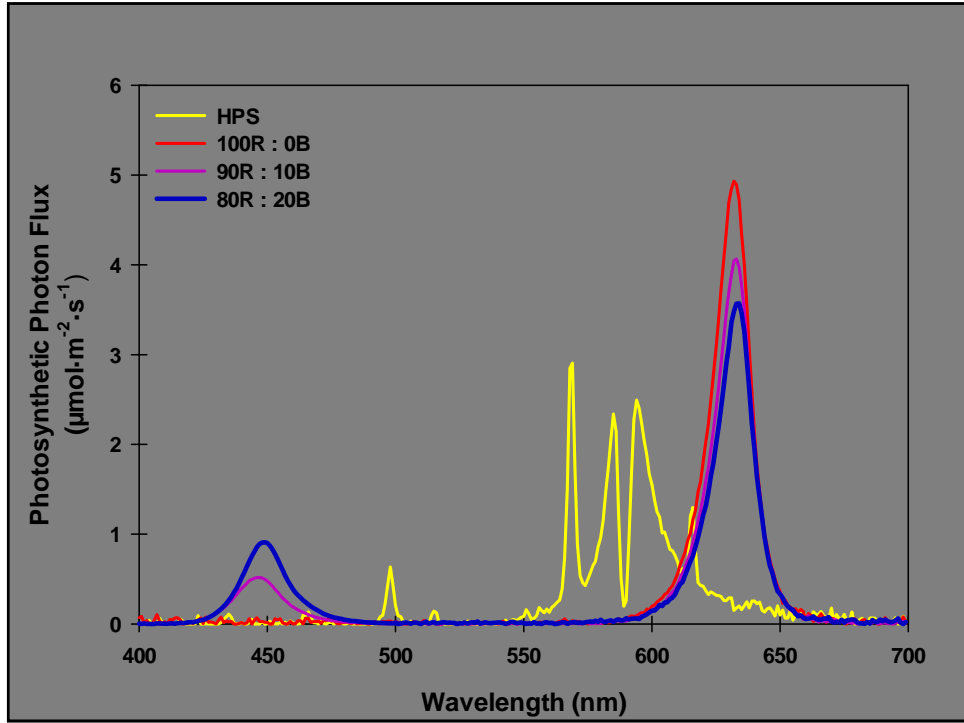
- High pressure sodium (HPS) – 150 watt

### Light emitting diodes (LEDS)

- 100 % Red LEDs (Orbitec 2<sup>nd</sup> Generation)
- 90 % Red 10 % Blue LEDs (Orbitec)
- 80 % Red 20 % Blue LEDs (Orbitec)







## *Celosia* 'Fresh Look Gold'

HPS

85R:15B

70R:30B



## *Celosia* 'Glow Pink'

HPS

100R: 0B

90R: 10B

80R: 20B

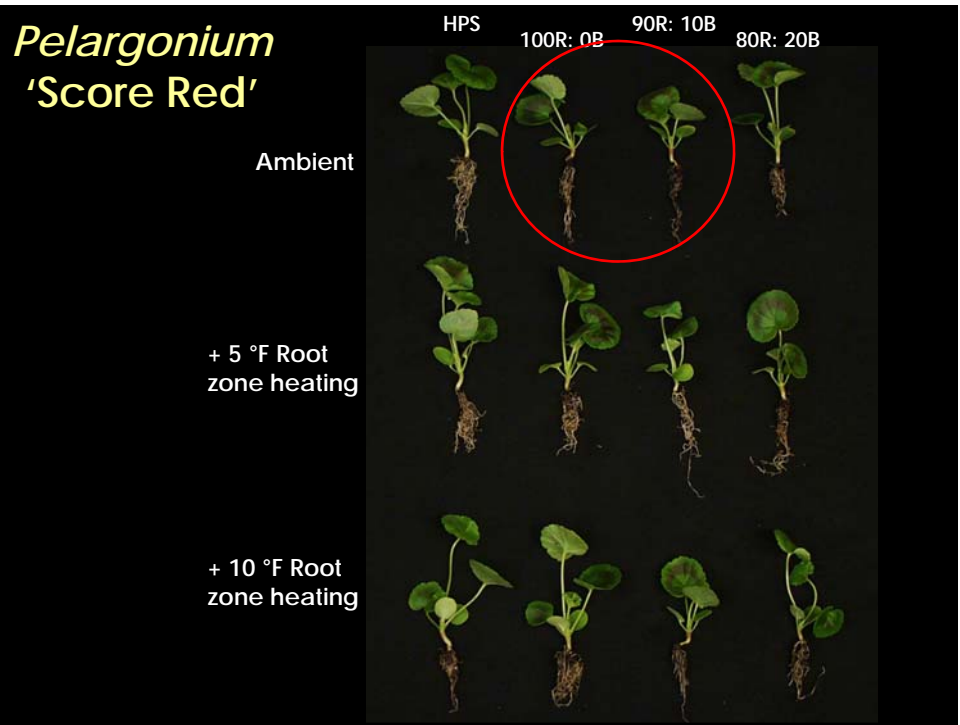
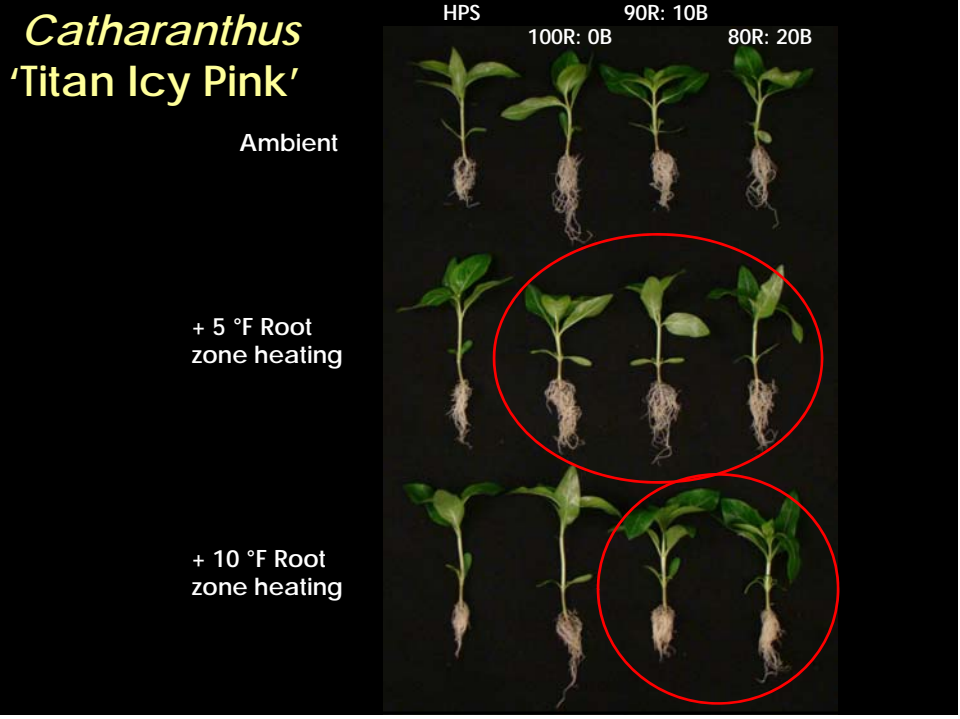
Ambient

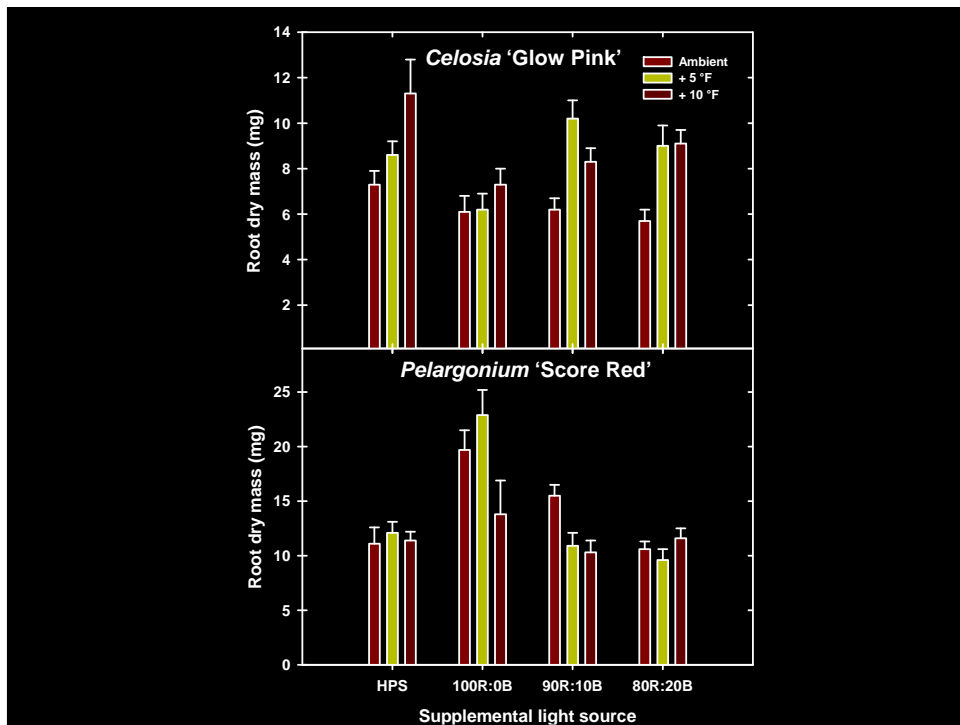
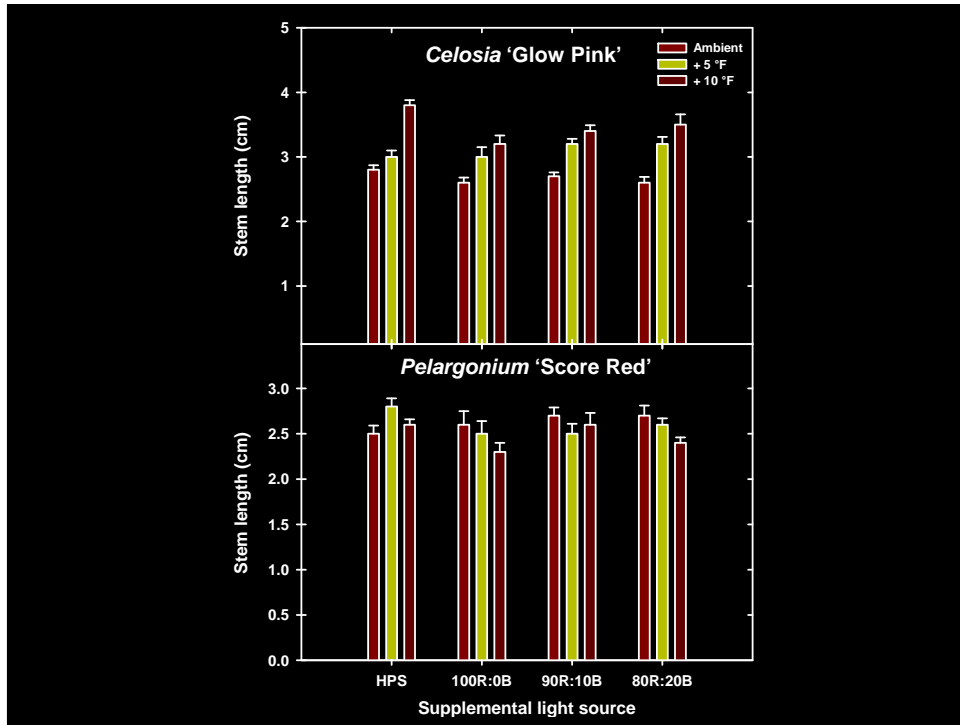
+ 5 °F Root  
zone heating

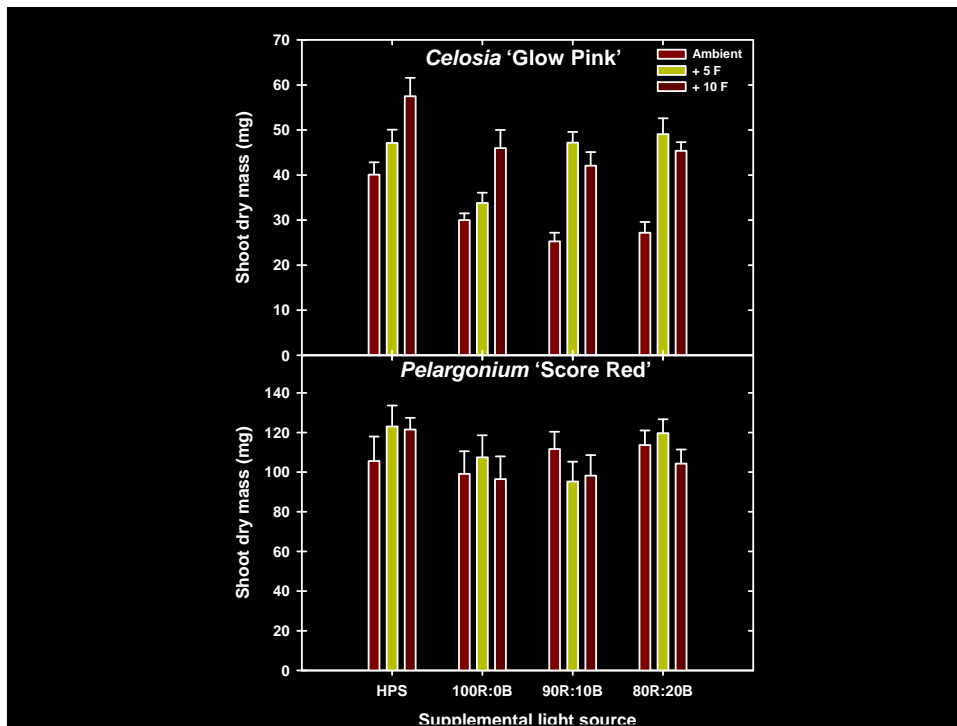
+ 10 °F Root  
zone heating











## Acknowledgements

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