

# Use LEDs to Improve Ornamental Crop Production

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## **Objective 1**

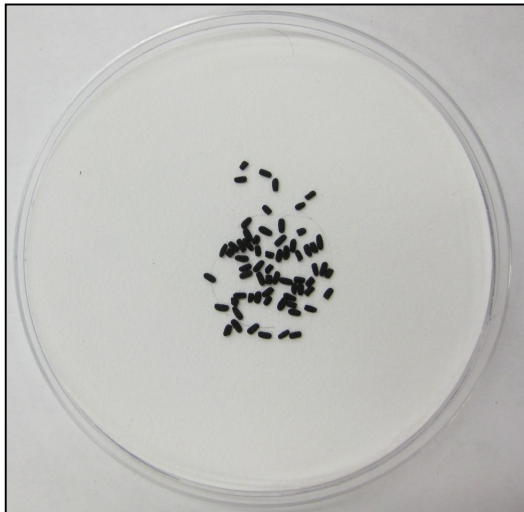
Investigate how different light quality affects seed germination and seedling performance of ornamental crops such gerbera

# Germination experiment

## Plant materials (1)

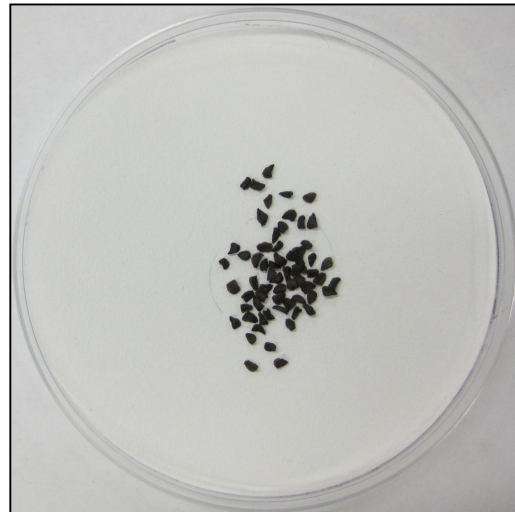
**Vinca**

*Catharanthus roseus*



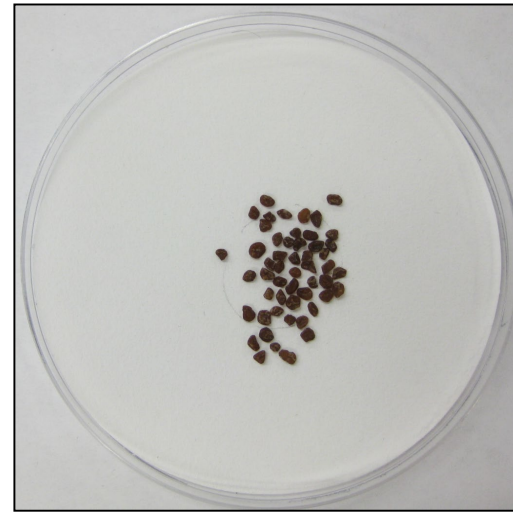
**Delphinium**

*Delphinium elatum*



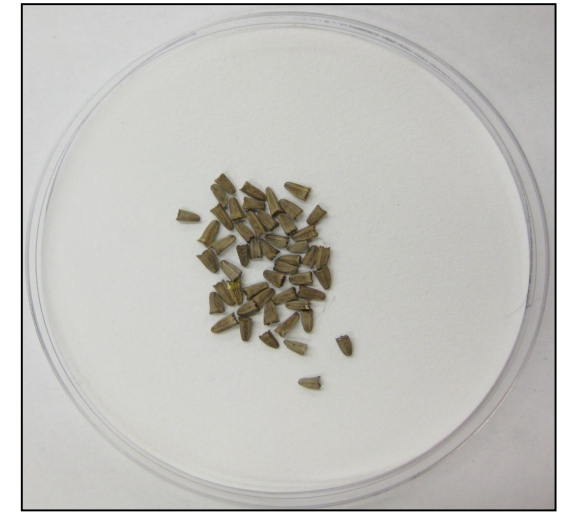
**Cyclamen**

*Cyclamen persicum*



**Echinacea**

*Echinacea ×hybrida*



# Plant materials (2)

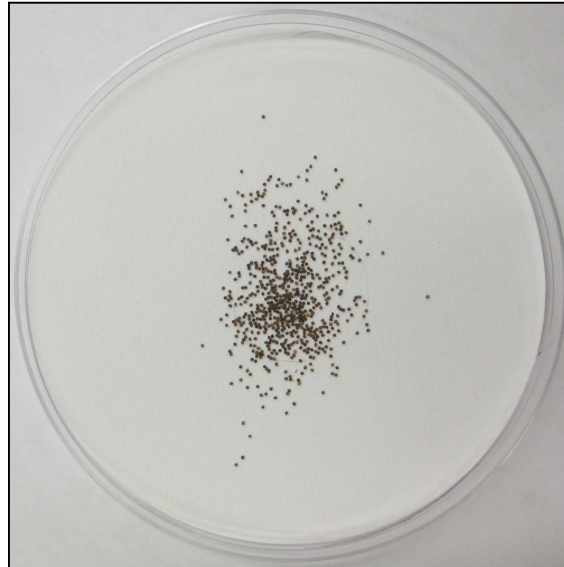
**Gerbera**

***Gerbera jamesonii***



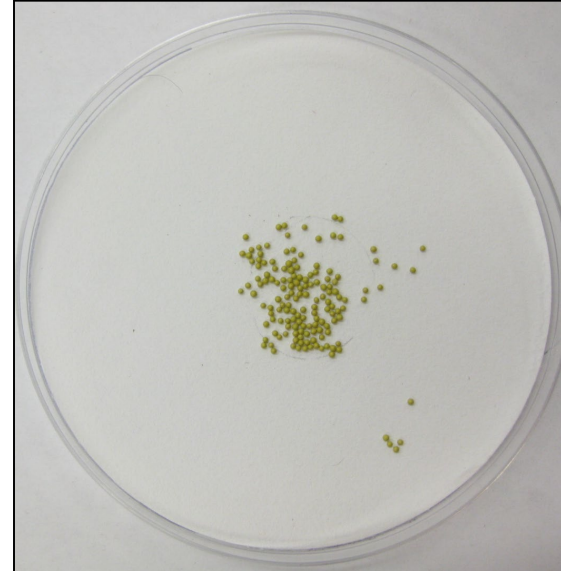
**Petunia**

***Petunia ×hybrida***



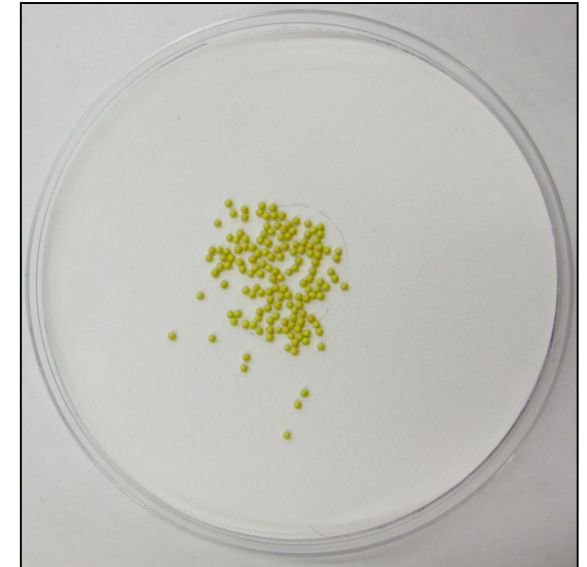
**Begonia**

***Begonia ×tuberosa***



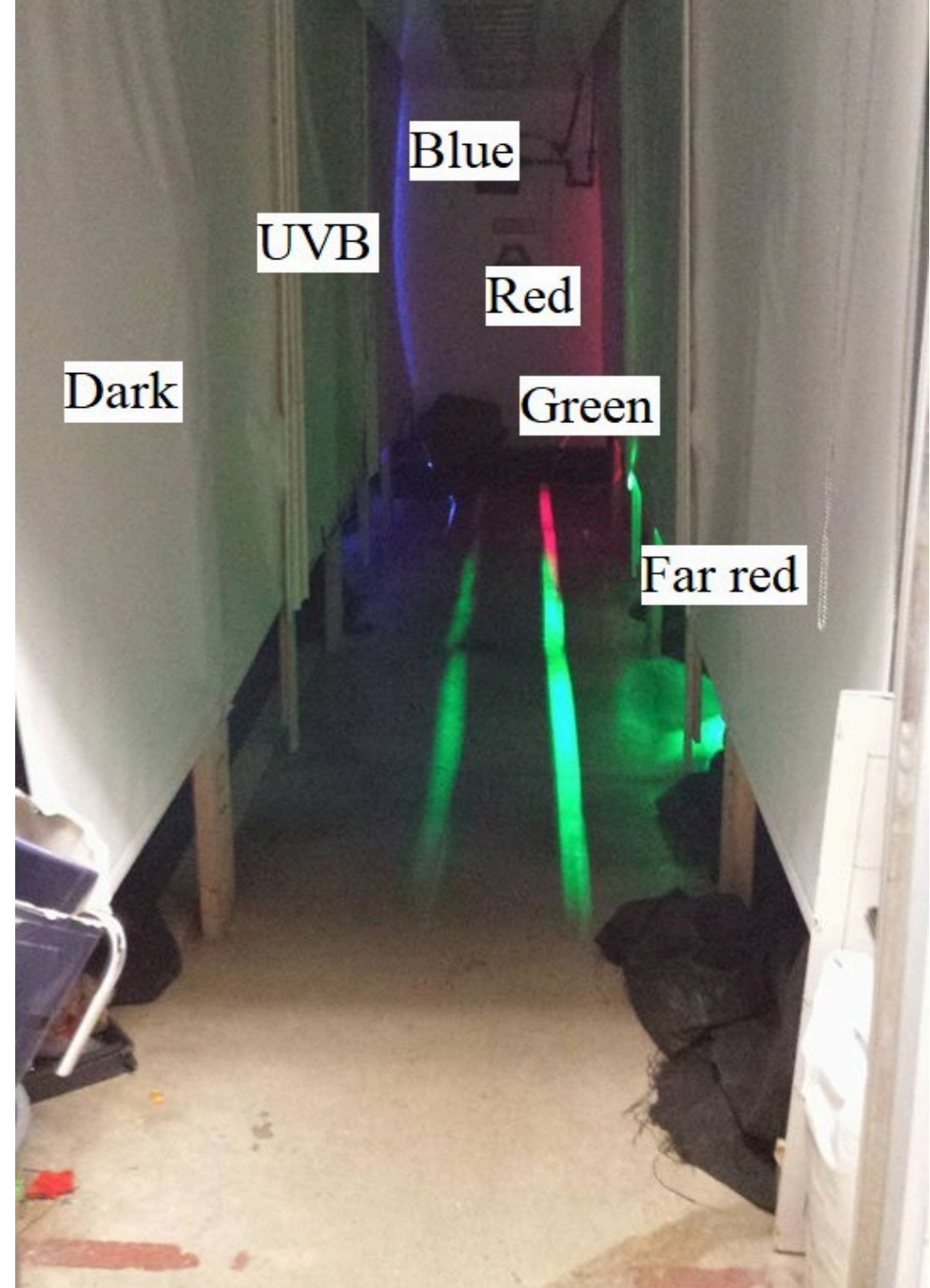
**Lisianthus**

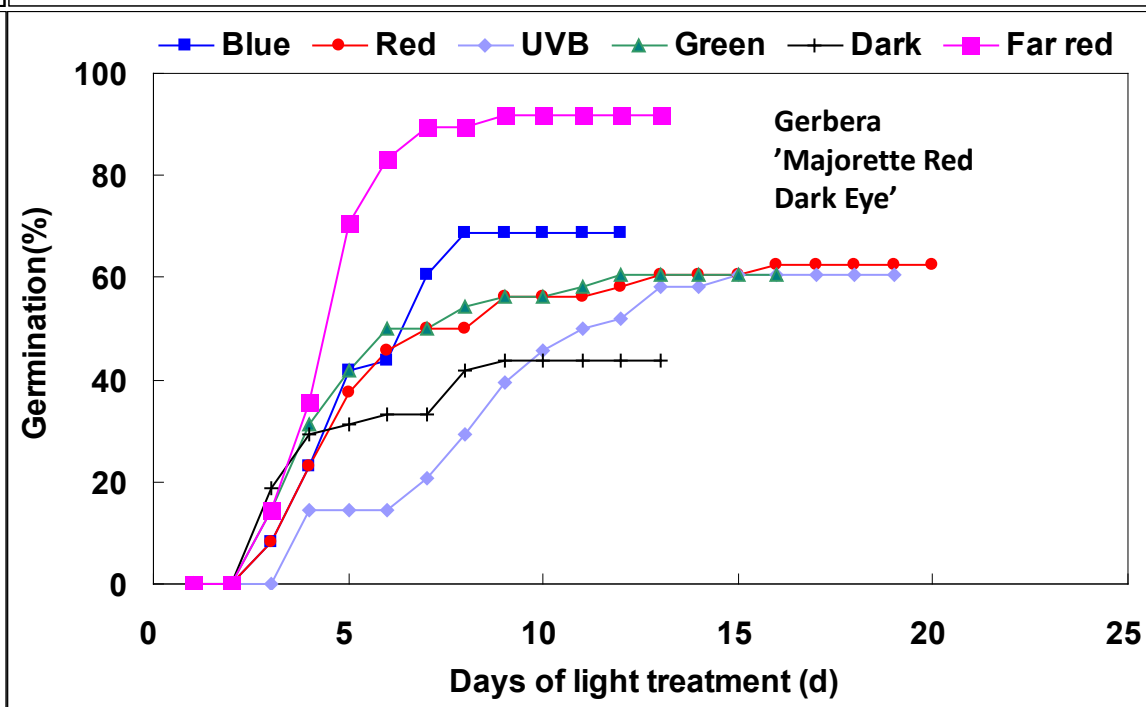
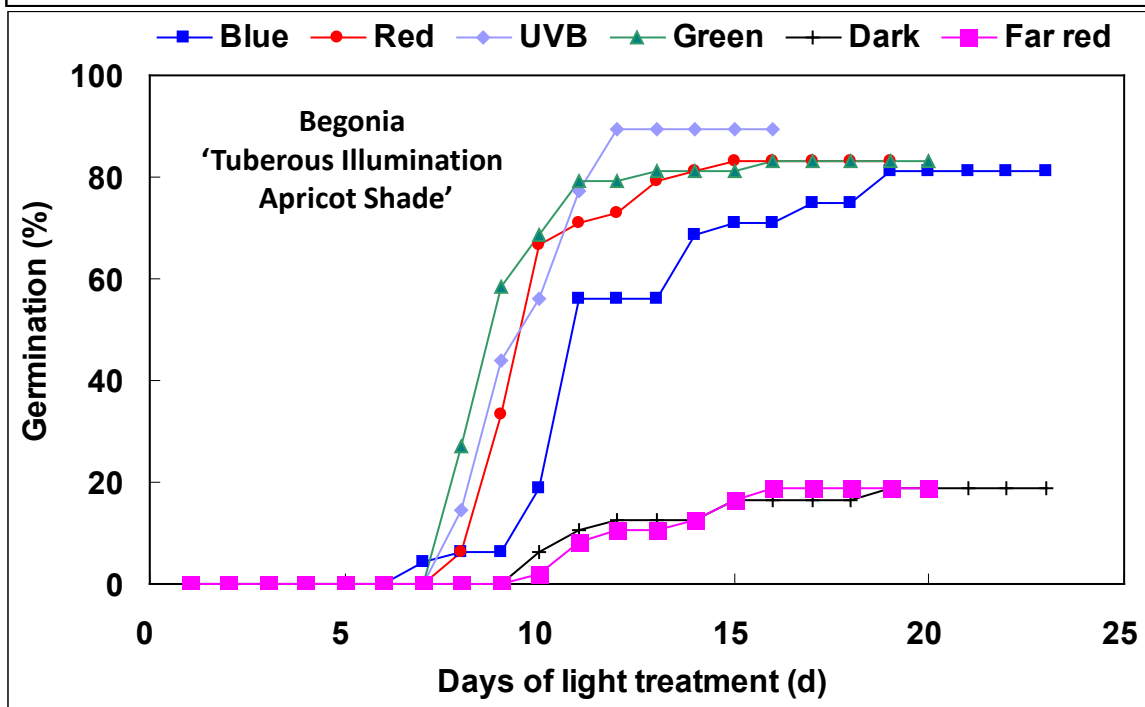
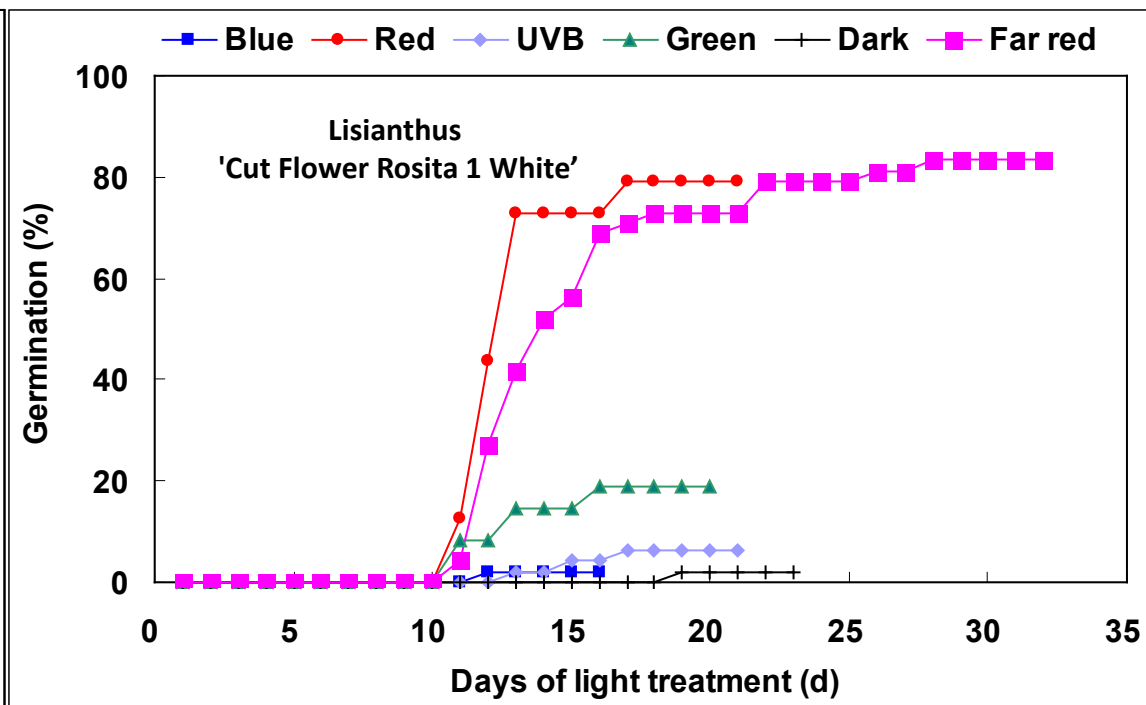
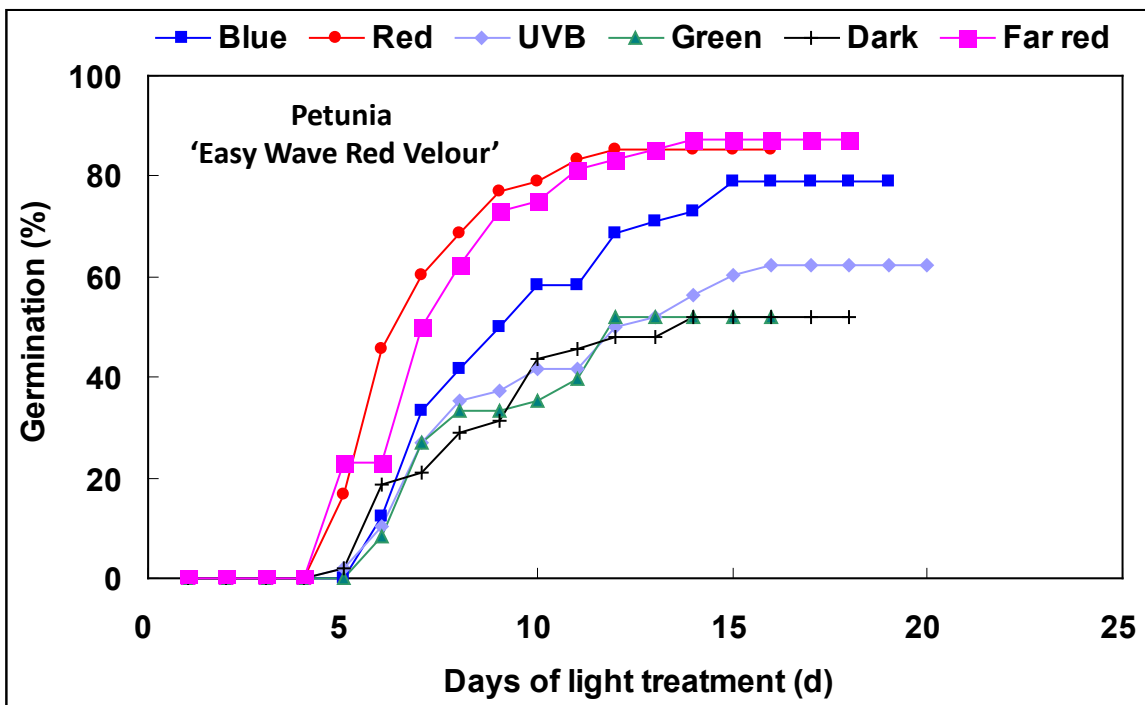
***Eustoma grandiflorum***



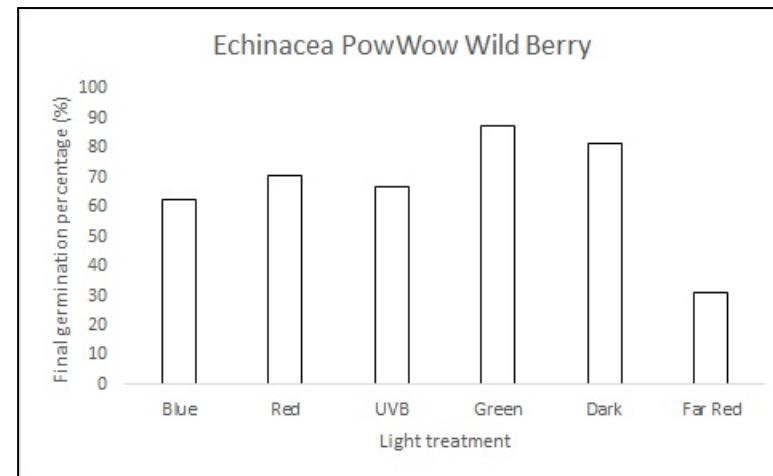
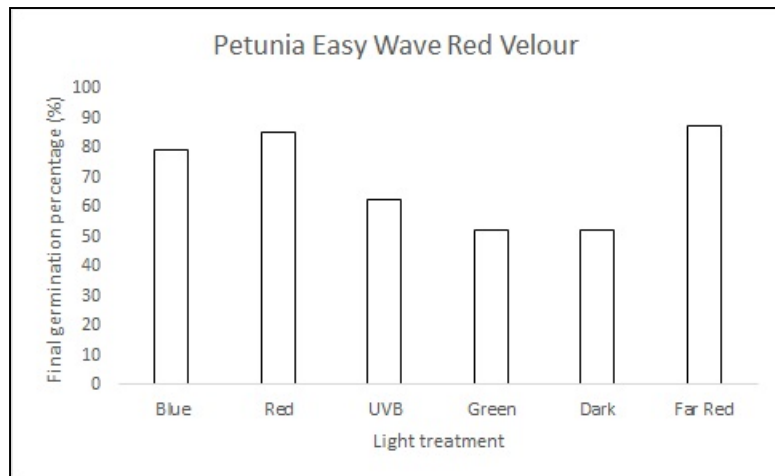
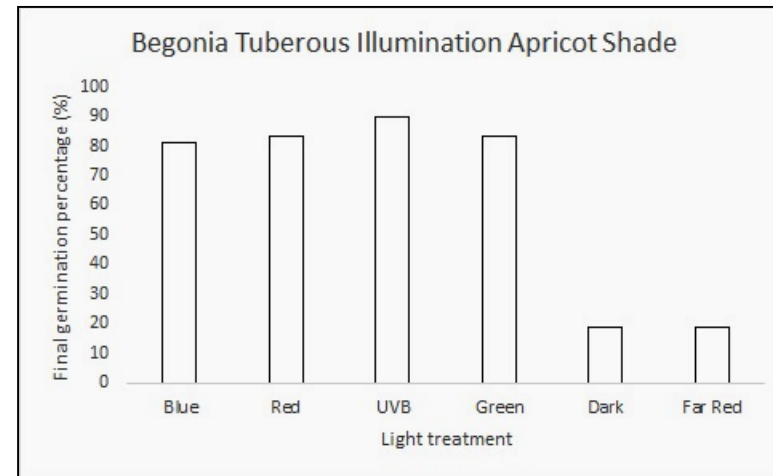
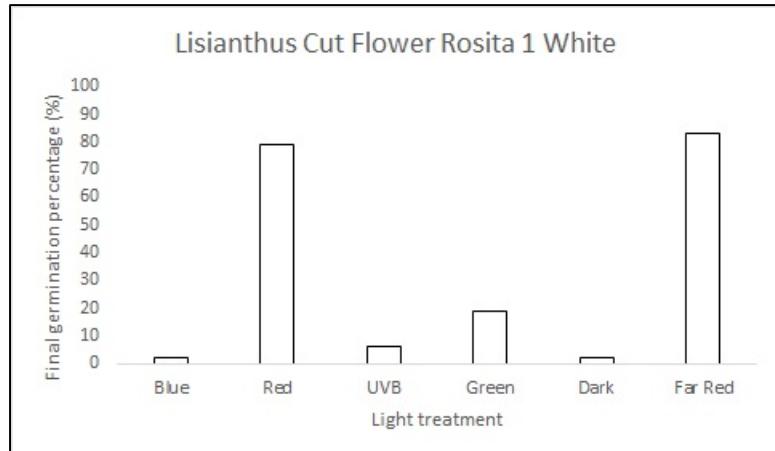
# Light treatments

- Dark control
- $0.5 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$  UVB
- $20 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$  for Blue, Green, Red, and Far red
- 24 h lighting





# Graphs from replicate 1



# Seedling growth experiment

## Plant materials



- *Gerbera jamesonii* 'Maxi White' and 'Midi Dark Purple'
- <http://www.bayviewflowers.com>



# Light treatments

- 6 light treatments at  $300 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$  PPFD for 16 h
  - Fluorescent
  - RB (85:15)
  - RB (85:15) +UVB ( $0.5 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ )
  - RB (85:15) +UVA ( $15 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ )
  - RB (62:15) +G ( $70 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ )
  - RB (85:15) +FR ( $21 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ )





**Fluor**

**RB**

**RB+UVB**

**RB+UVA**

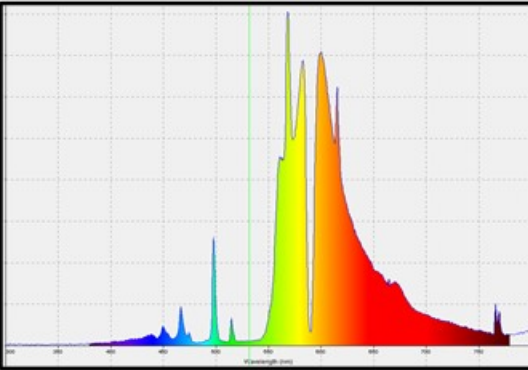
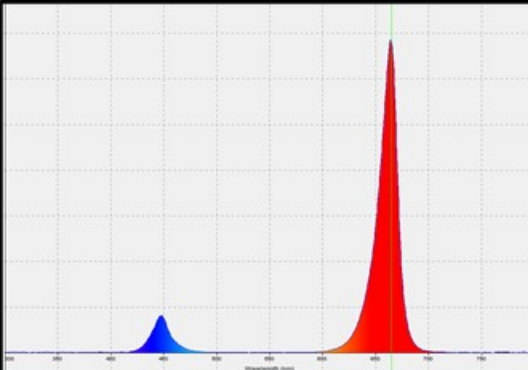
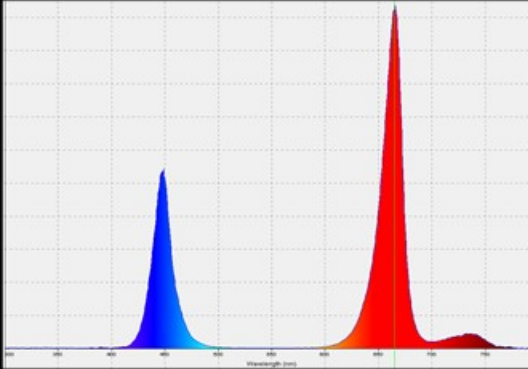
**RB+G**

**RB+FR**

**Seedling growth after 33 days of lighting**

## **Objective 3**

Investigate the efficacy of replacing HPS lamps with LEDs as supplemental lighting in greenhouse crop propagation systems

Fixture Type	Manufacturer	Fixture Model	Spectrum	
HPS	PL Lights	NXT2	Broad spectrum	
LED	Hortilux	HortiLED Top	Blue 7 : Red 93 : Far-red 0	
LED	Yunustech	CERES V	Blue 23 : Red 71 : Far-red 6	

# Treatments

- 3 supplemental light spectra
  - Supplemental PPFD in all lit plots =  $50 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$
- 2 control algorithms:
  - Threshold- avg duty cycle = 5.2 hr, supplemental DLI =  $0.95 \text{ mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$
  - Continuously on- duty cycle = 14 hr, supplemental DLI =  $2.5 \text{ mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$

= 6 supplemental lighting treatments + 1 ambient control

Mean natural DLI =  $\sim 7.7 \text{ mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$

## 3 Species, 2 Cultivars Per Species

- Begonia (cultivars: Netja Dark and Blitz)
- Kalanchoe (cultivars: Paris and Danielle)
- Chrysanthemum (cultivars: Chowchilla and Junea)

# Experimental Design

- 7 treatments
  - 16 cuttings stuck for each treatment X crop combination
- Measurements
  - Weekly
    - Rooting time
    - Leaf number
    - Height
  - End of propagation period
    - Relative chlorophyll content
    - Fresh and dry mass
    - Transplant quality
    - Time to flowering (post transplant)







Kalanchoe Development: Danielle Variety

14hr  
Treatments

Week 6

Week 5

Week 4

Hortilux



Yunustech



HPS



Unlit



Threshold  
Treatments

Week 6

Week 5

Week 4

Hortilux



Yunustech



HPS



Unlit



# Chrysanthemum Development

Chowchilla variety: 4 weeks in propagation, ready to move to finishing

14hr Treatments

Threshold Treatments

Hortilux

Yunustech

HPS

Hortilux

Yunustech

HPS

Unlit  
Control



# Chrysanthemum Development

Junea variety: 4 weeks in propagation, ready to move to finishing

14hr Treatments

Threshold Treatments

Hortilux

Yunustech

HPS

Hortilux

Yunustech

HPS

Unlit  
Control



# Thanks

