

Use LEDs to Improve Ornamental Crop Production

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Qingming Li, Chevonne Dayboll and Theo Blom

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Light Quality and Stock Plants

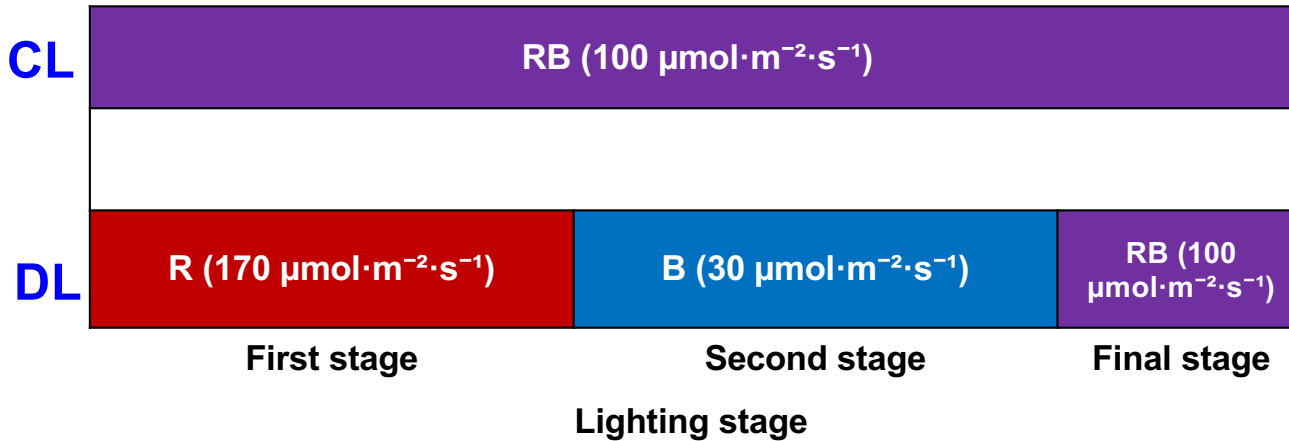
Objective: Investigate the effects of different lighting strategies on stock plant characteristics; and develop lighting strategies for improving ease of harvesting and quality of cuttings.

Campanula portenschlagiana 'PGM Get MEE®'



Light treatments

- Concurrent lighting (CL): RB (R85:B15) LED
- Dynamic lighting (DL): R (100%) → B (100%) → RB LED

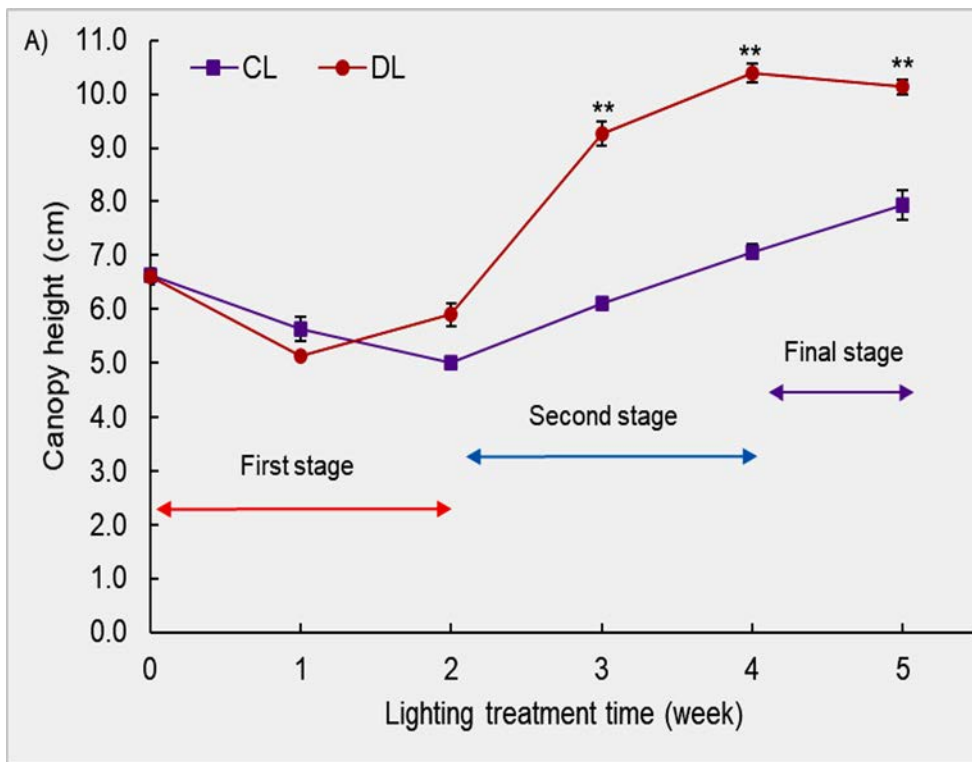


Chamber conditions:

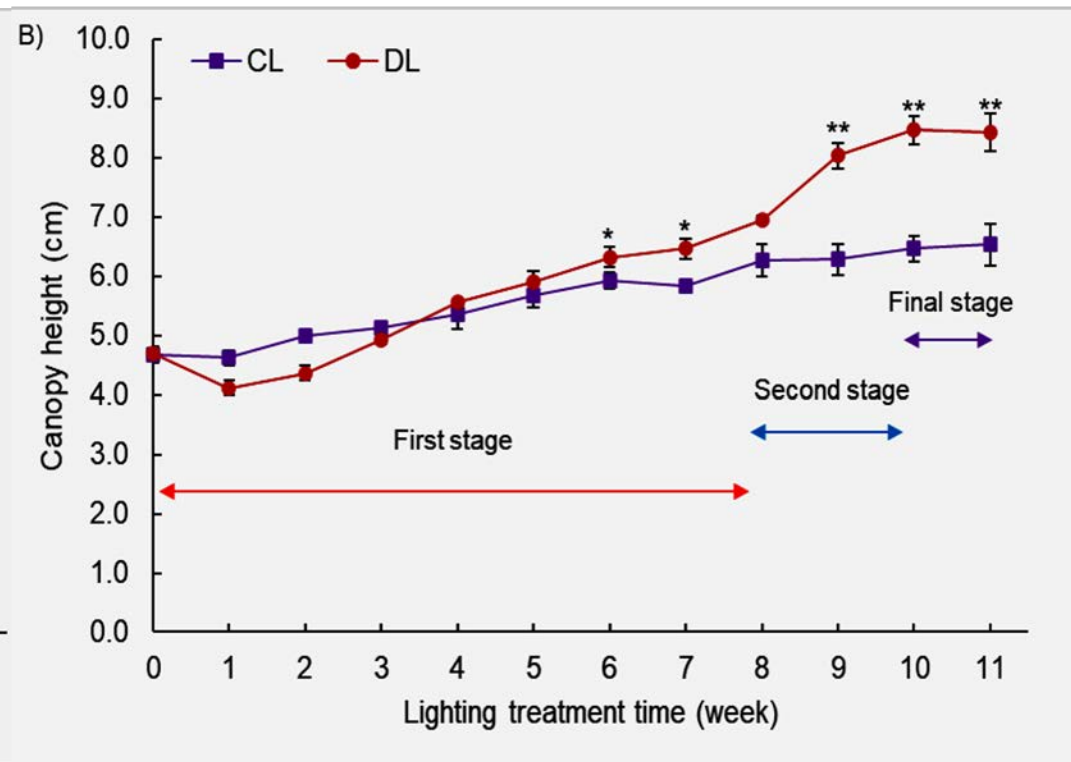
- Air temperature: 21°C
- Air RH: 75%



Weekly variation of canopy height

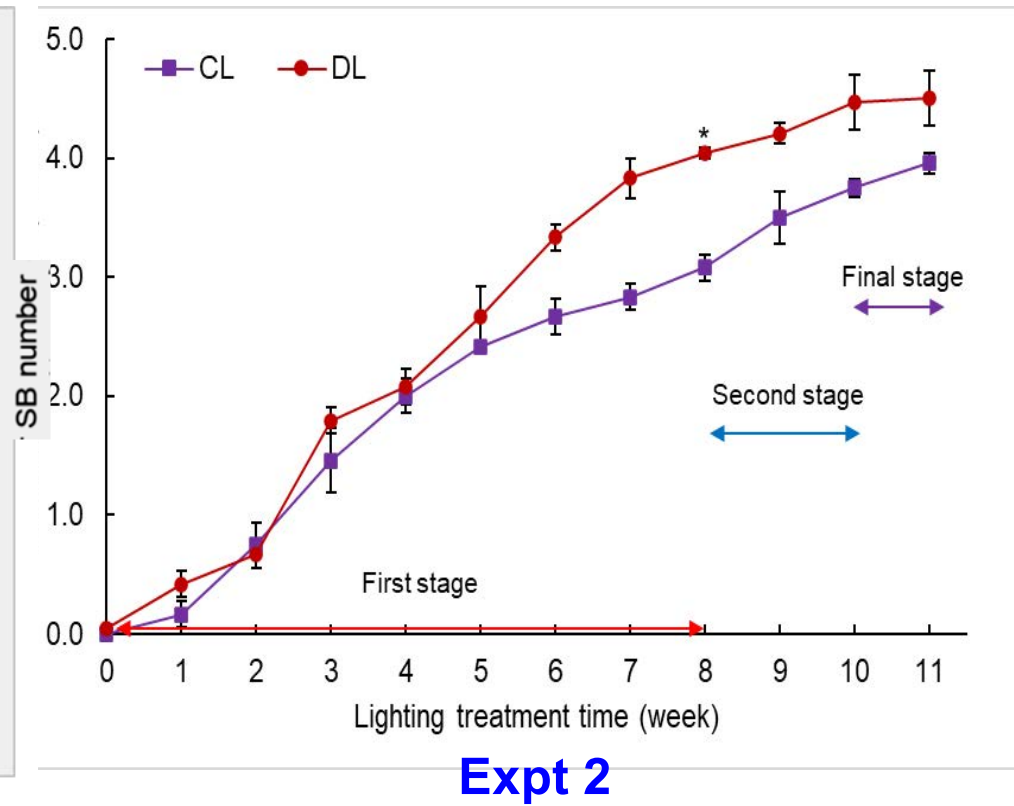
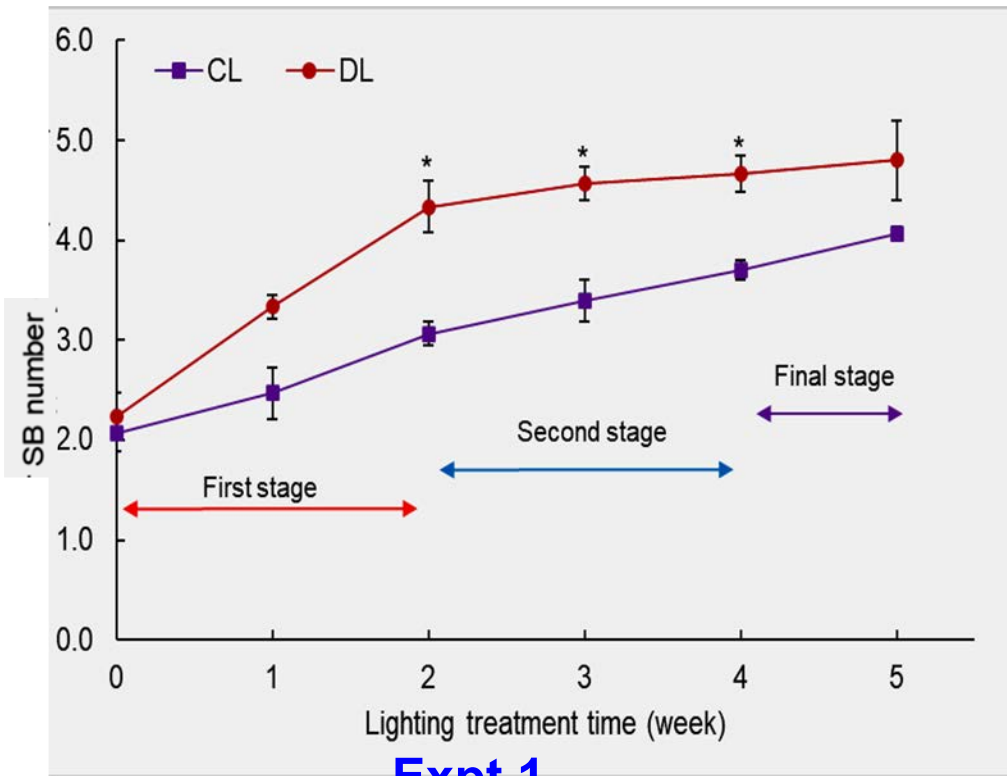


Expt 1. 24hr photoperiod

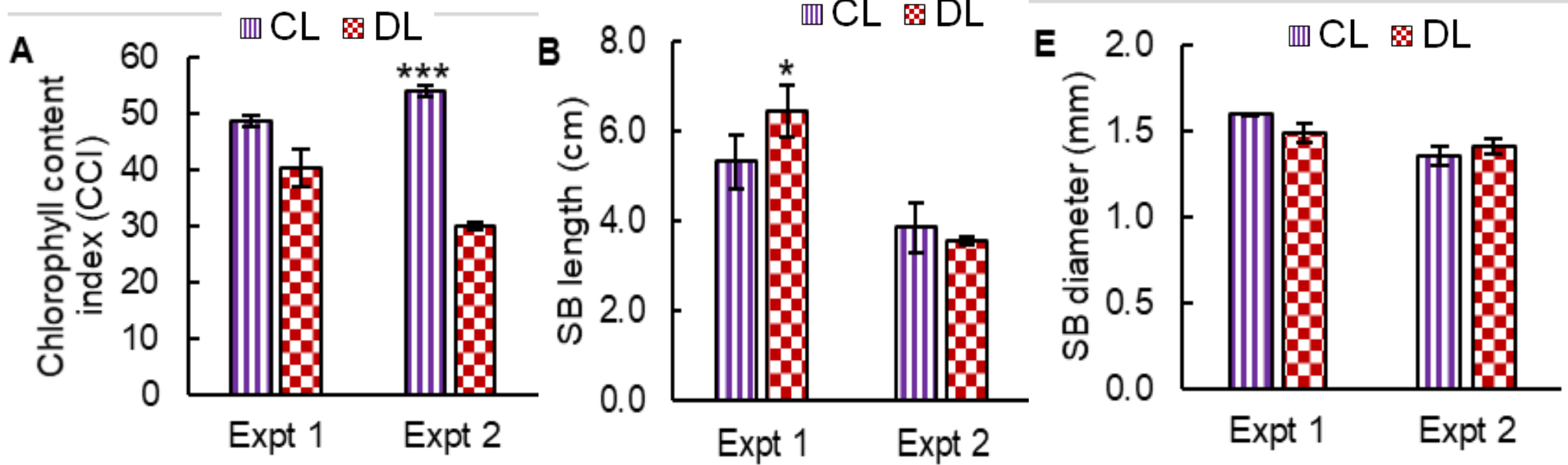


Expt 2. 10hr photoperiod

Weekly variation of side branch number



Morphology of stock plants at harvest



Expt 1, 24h photoperiod

First stage



Second stage



Final stage



CL DL
Light treatments

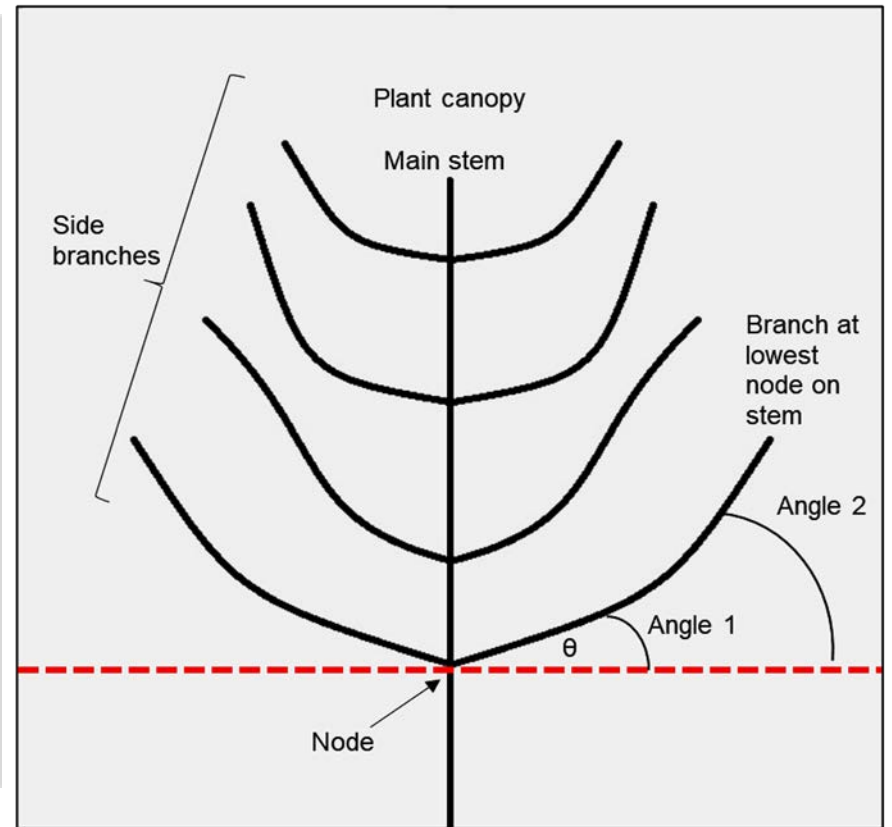
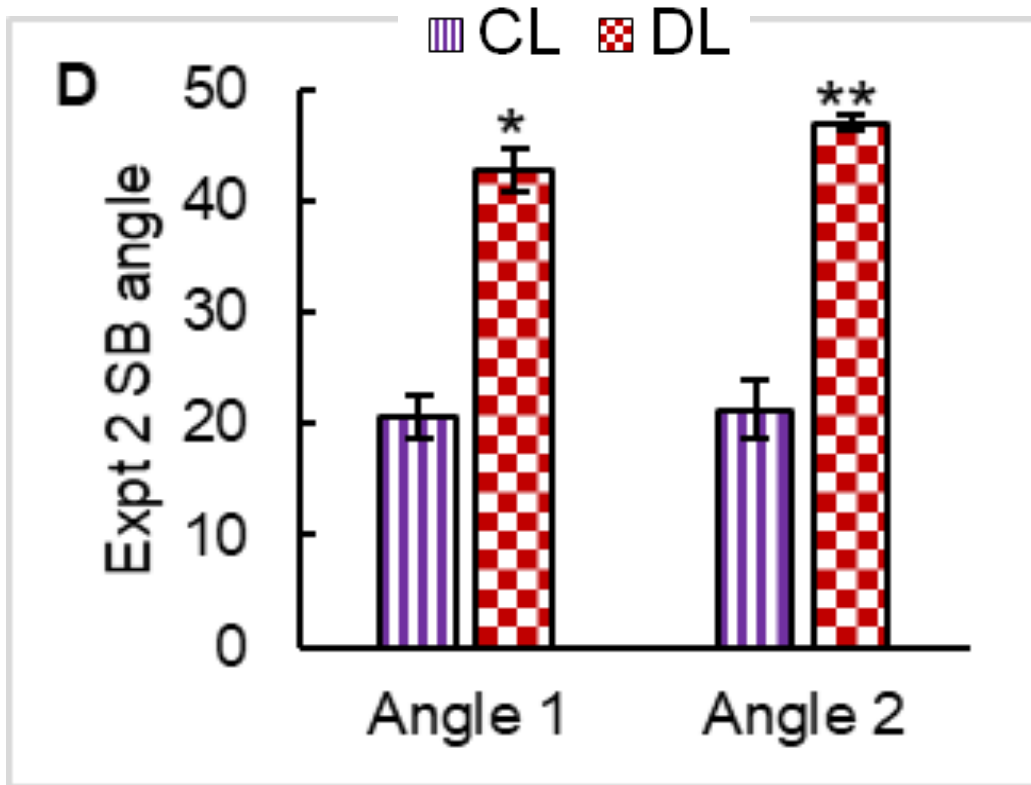


CL DL
Light treatments

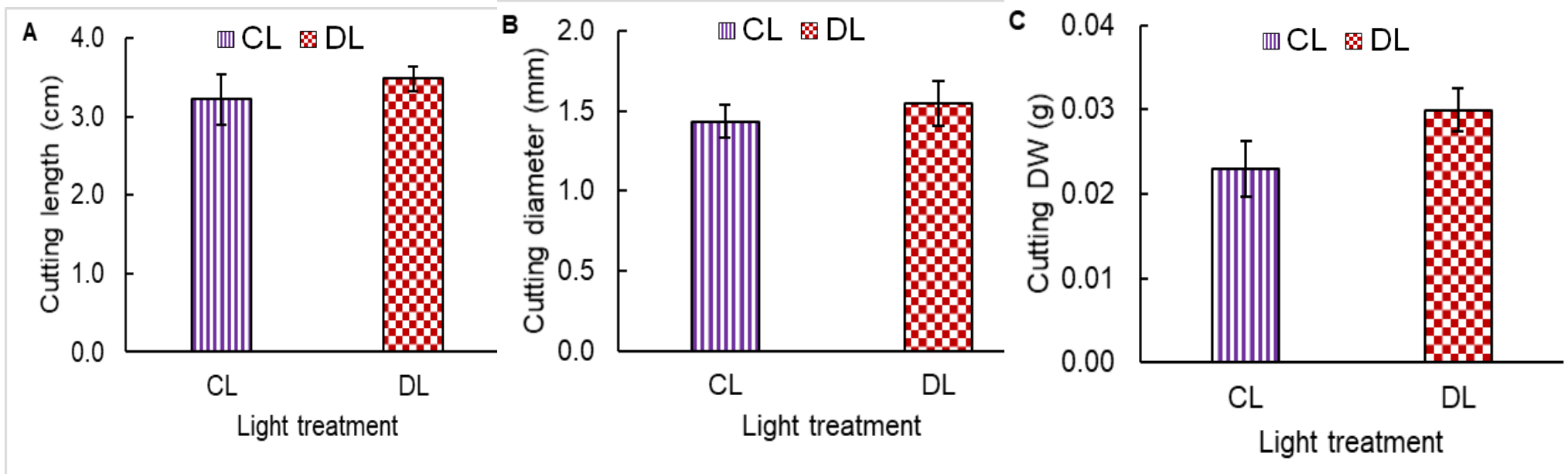


CL DL
Light treatments

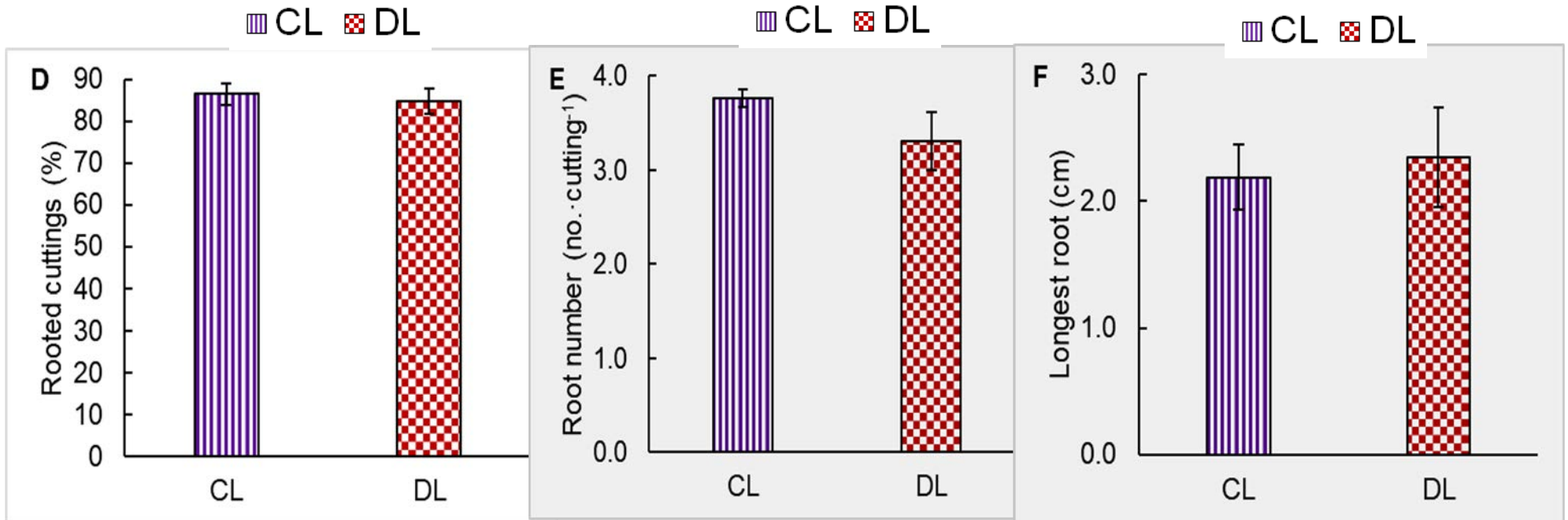
Angles of side branches of stock plants (Expt 2)



Cutting quality (Expt 2)



Rooting results (Expt 2)



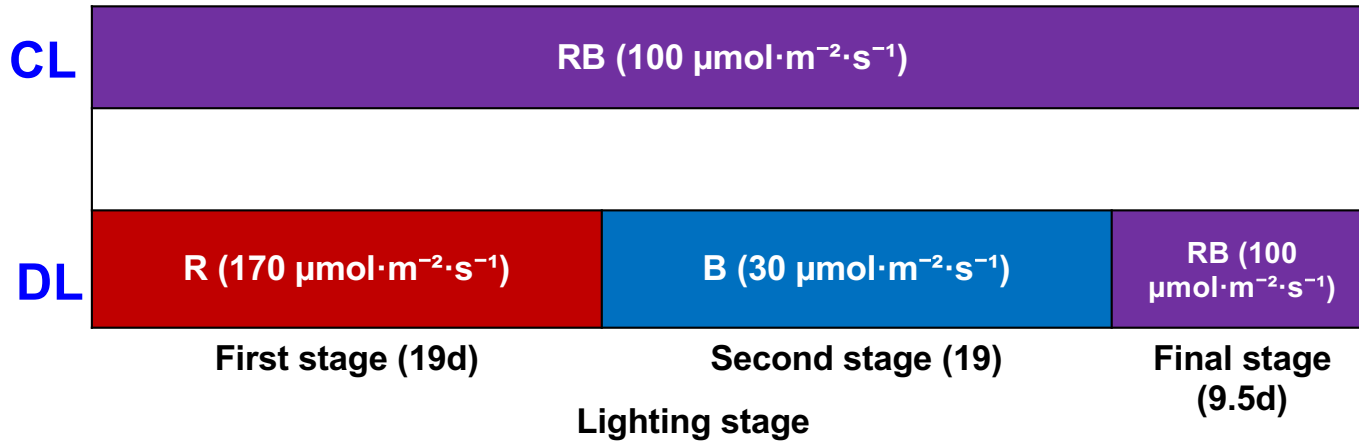
Chrysanthemum morifolium, 'Snowdon'



18-h photoperiod

Light treatments

- Concurrent lighting (CL): RB (R85:B15) LED
- Dynamic lighting (DL): R (100%) → B (100%) → RB LED

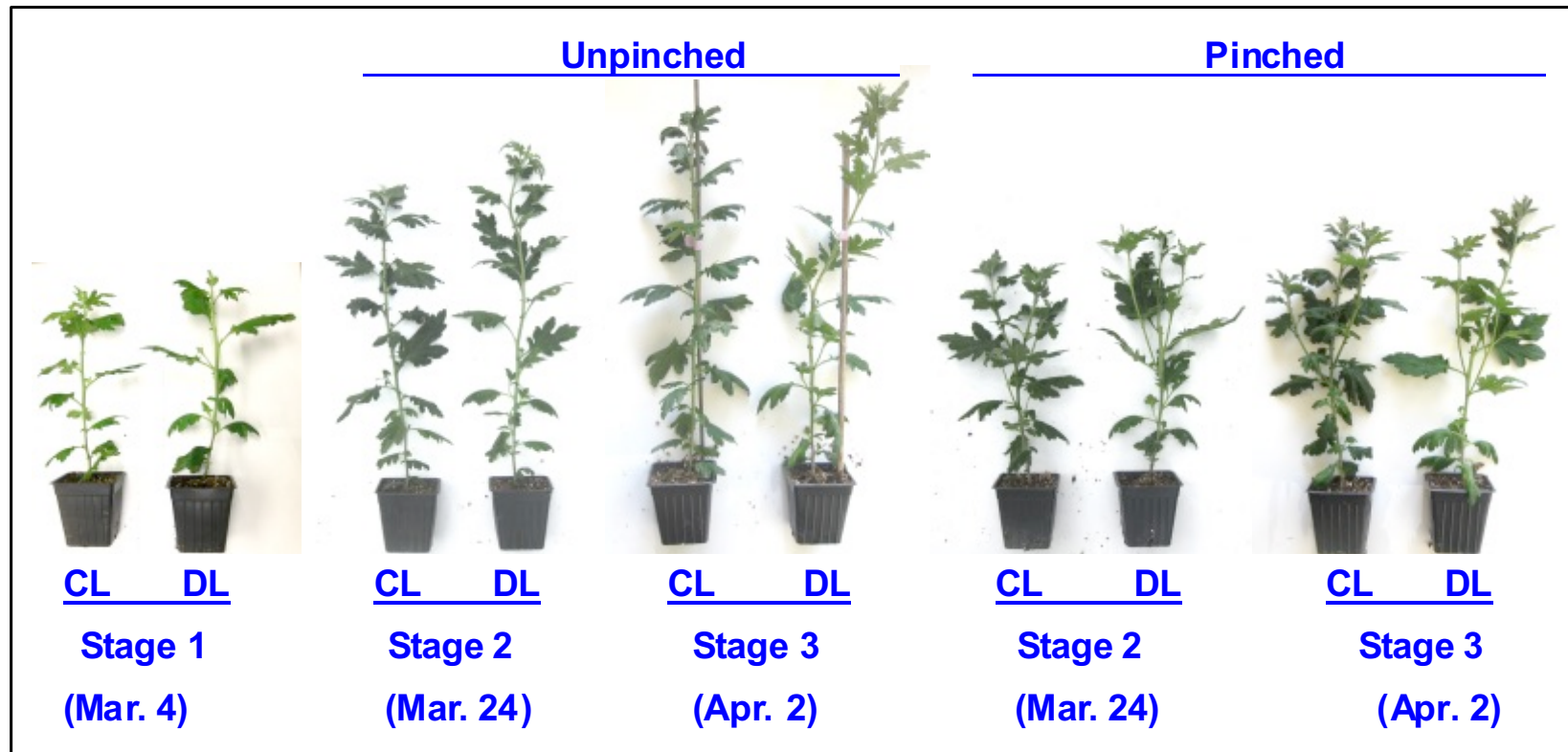


Chamber conditions:

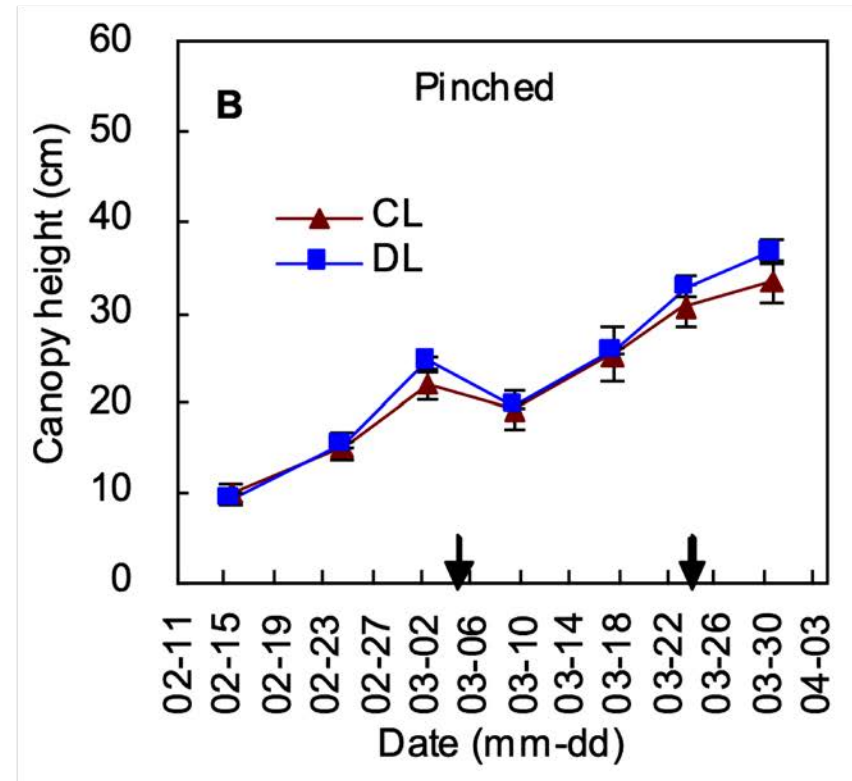
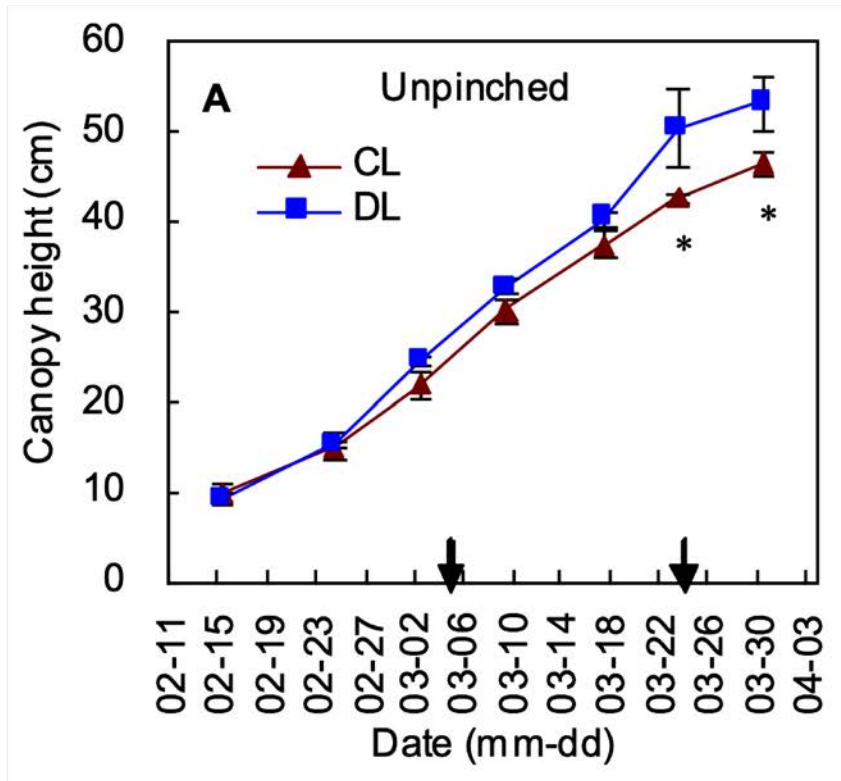
- Air temperature: 21°C
- Air RH: 75%



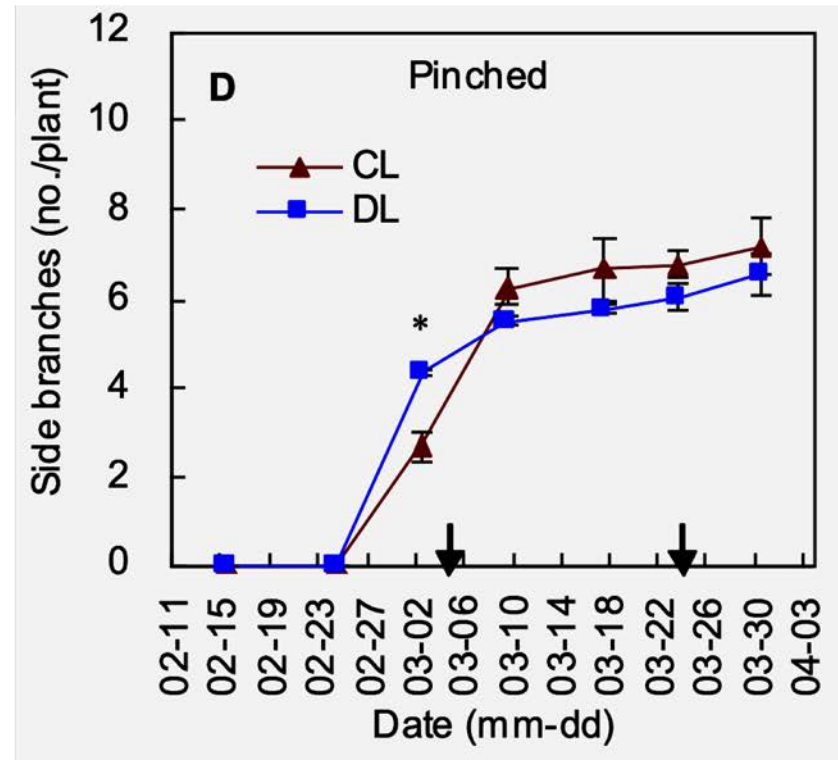
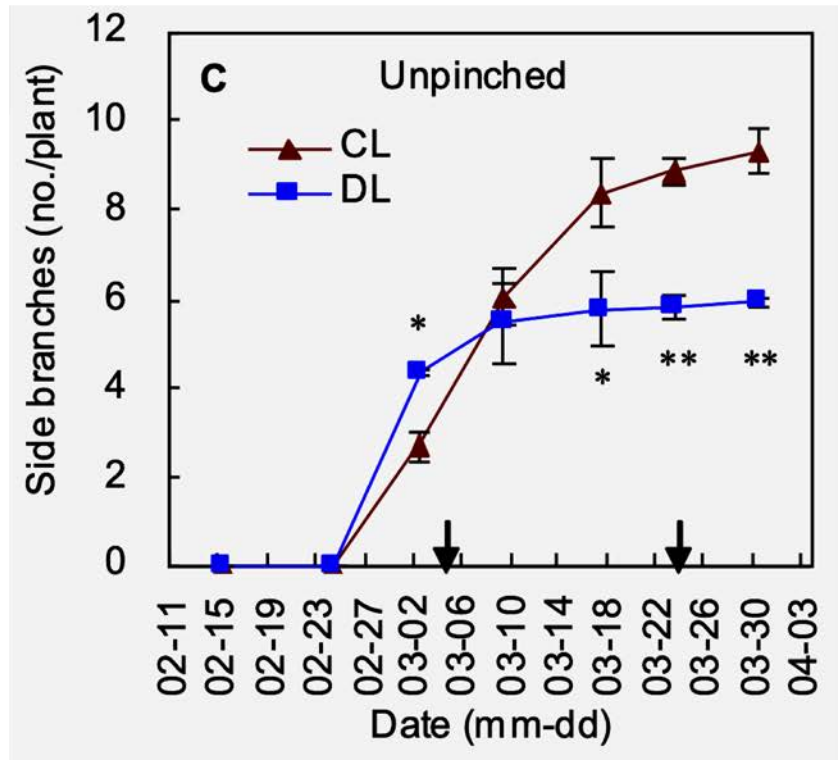
Plant morphology at each lighting stage



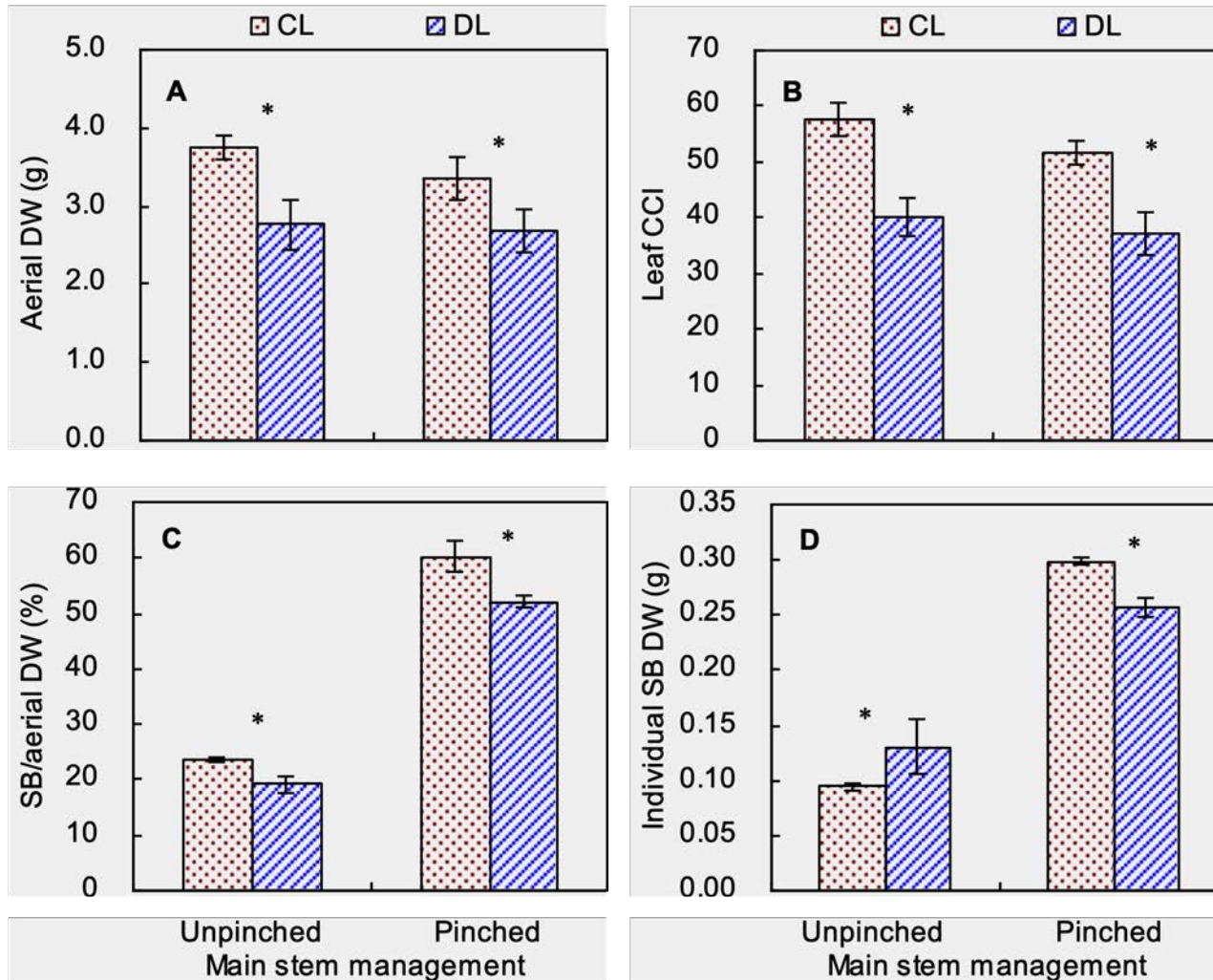
Temporal variation of canopy height



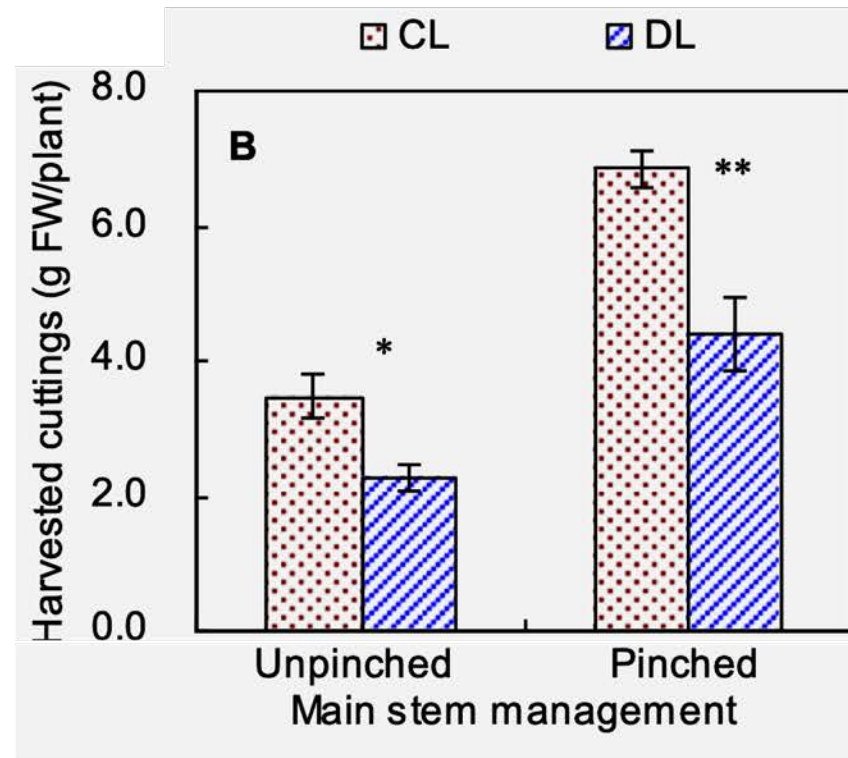
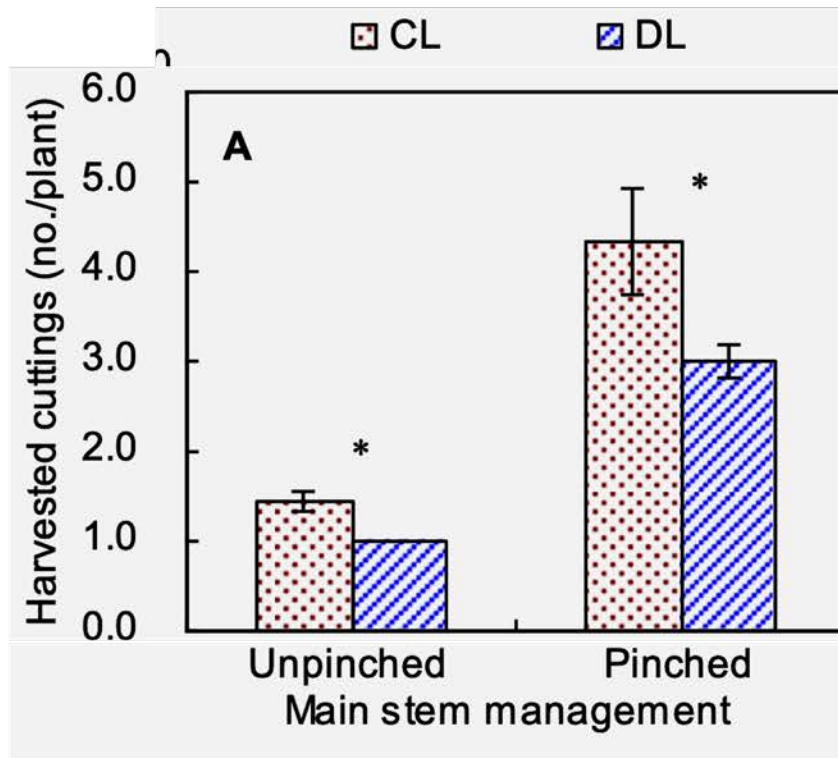
Temporal variation of side branch number



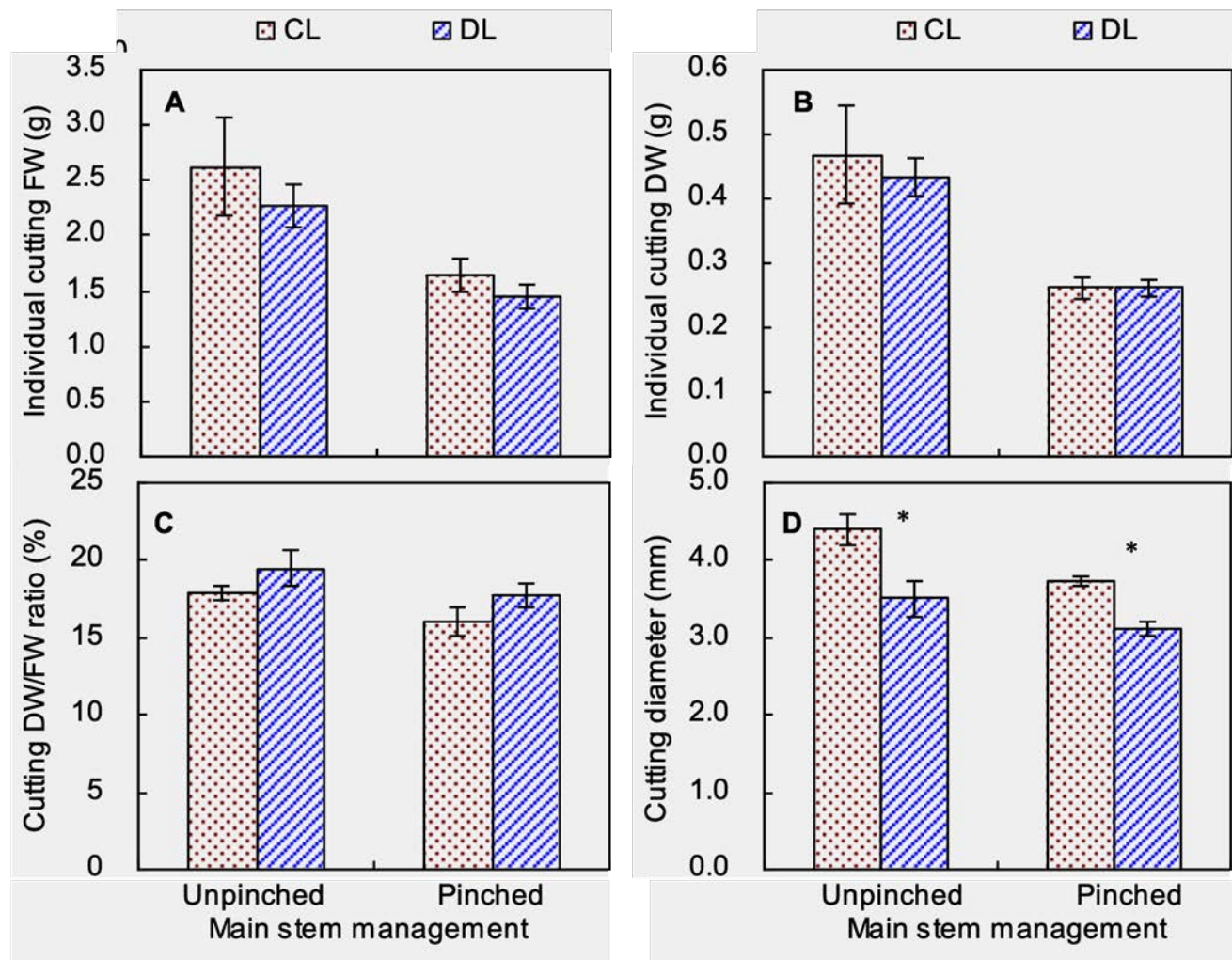
Final biomass and morphology of stock plants



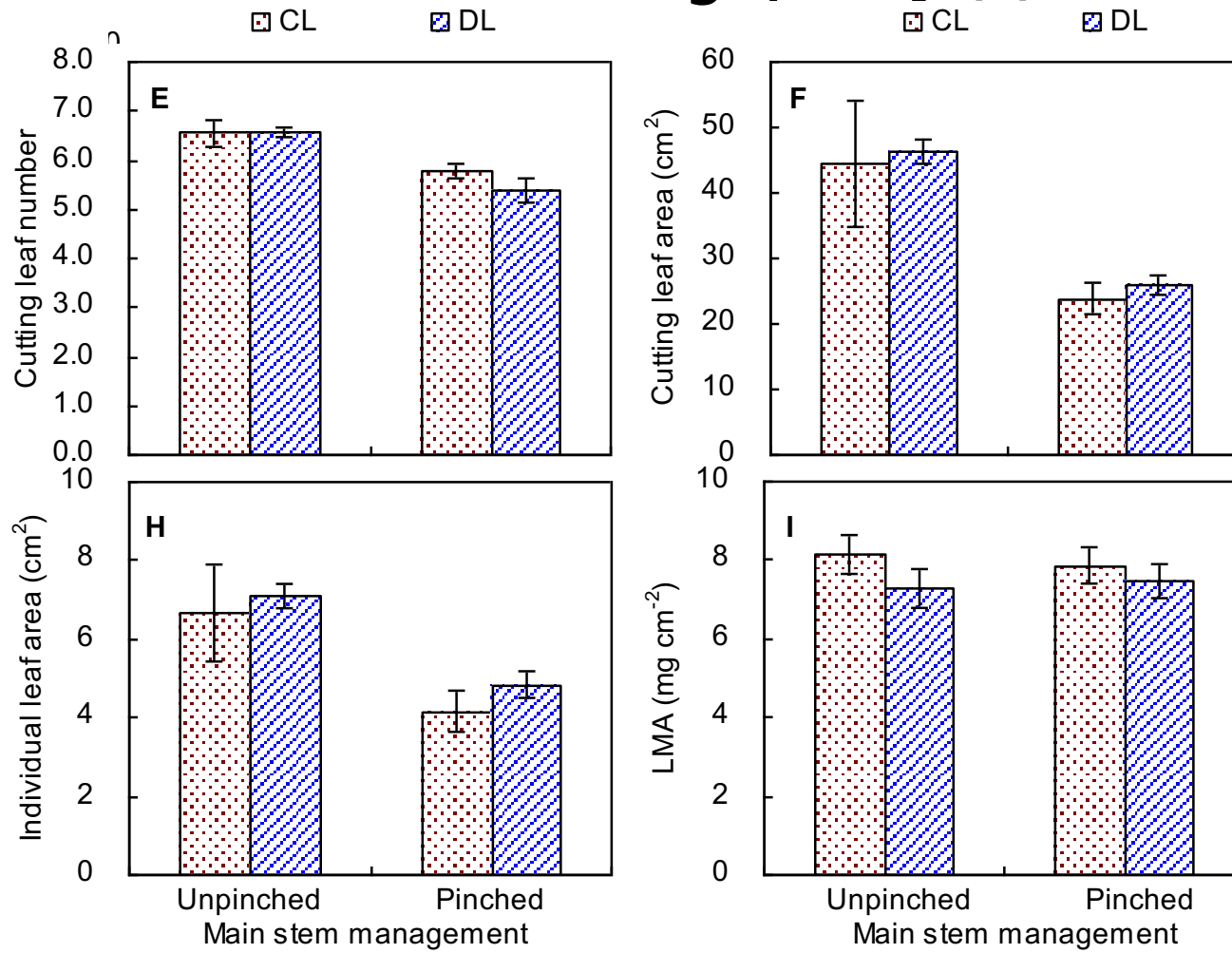
Yield of cuttings harvested from stock plants



Cutting quality (1)

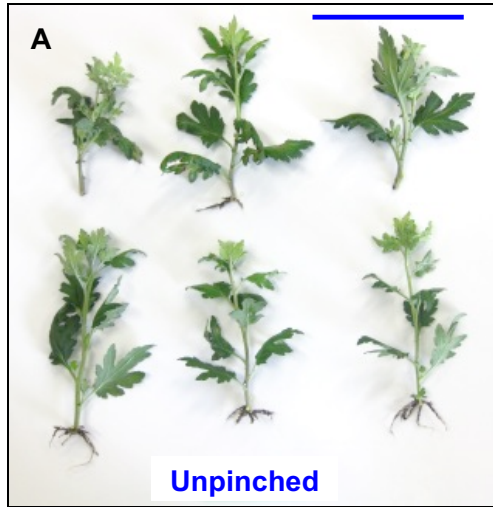


Cutting quality (2)

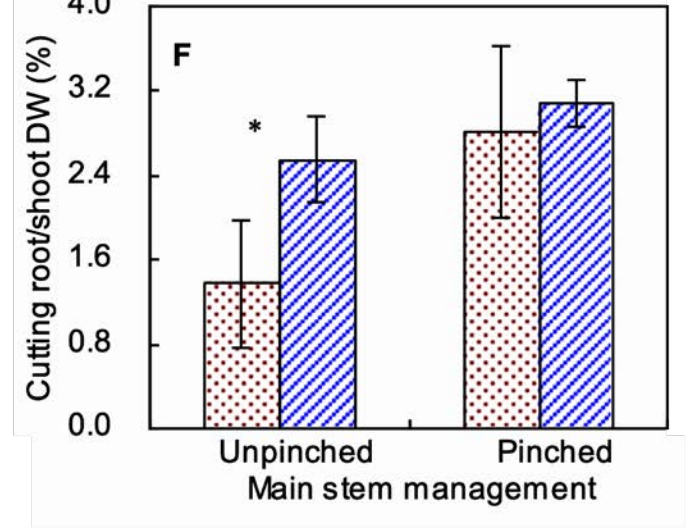
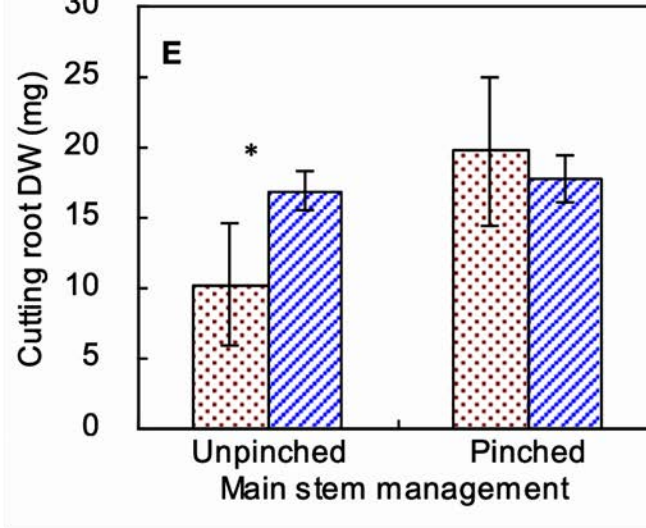
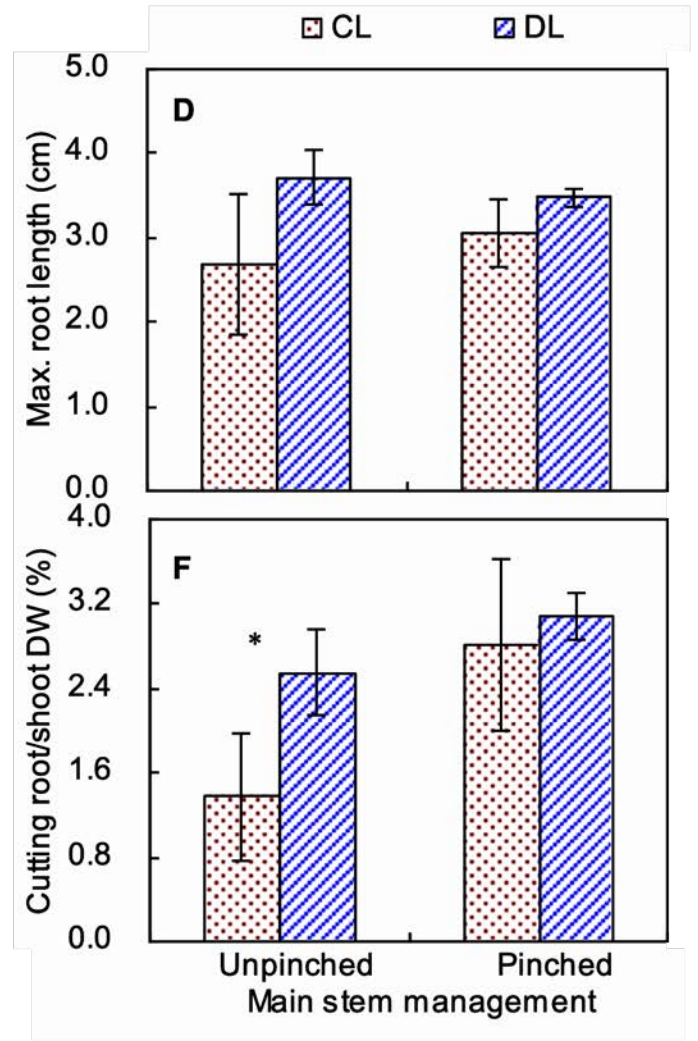
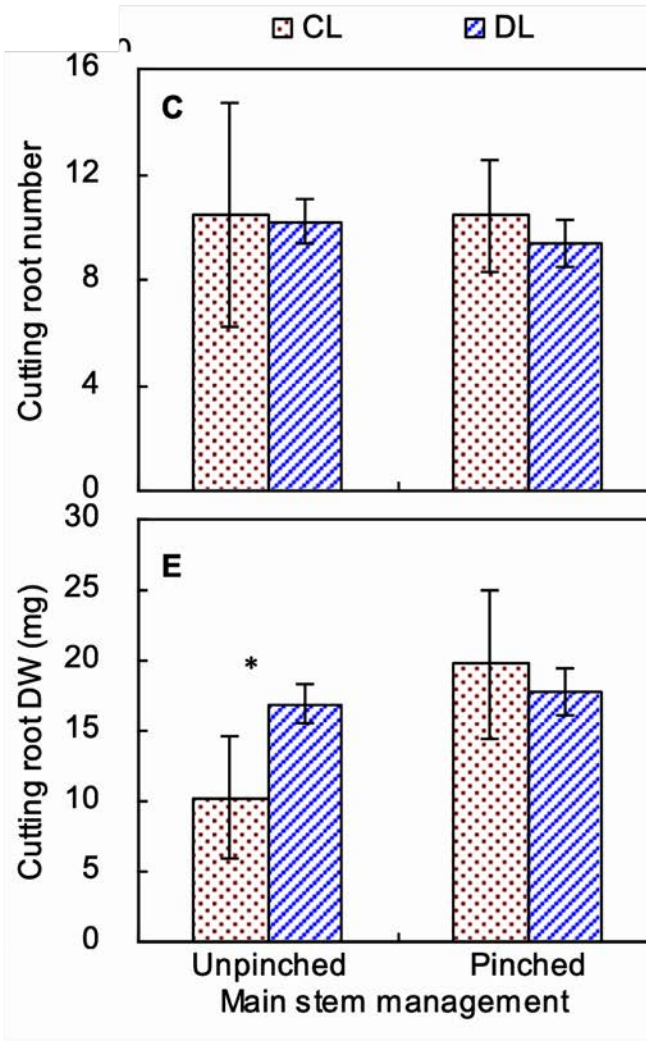
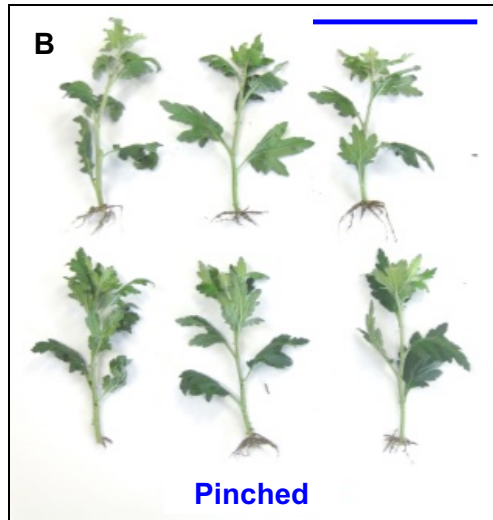


Rooting Results

Light treatments
CL
DL



Light treatments
CL
DL



Improving Quality of Potted Flowering crops Using End-of-Day **Spectrum** Treatments

Objective

Use end of day (EOD) LED light spectrum treatments to control plant morphology and flowering responses in flowering ornamentals

- Low intensity = low power and \$\$
- Reduced need for chemical growth regulators

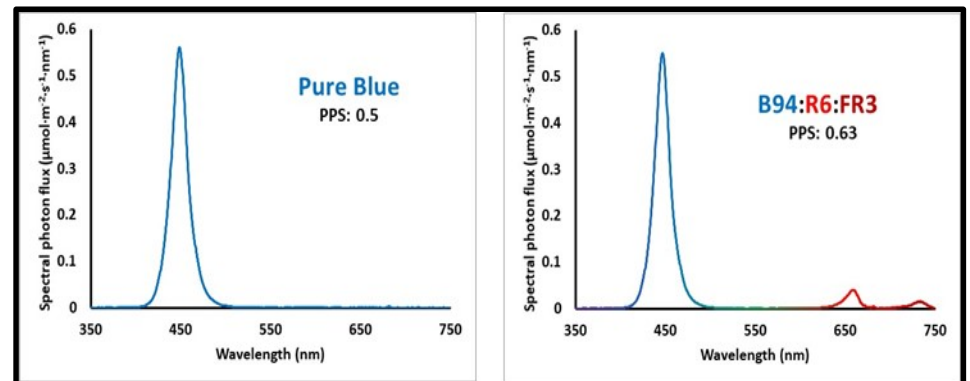
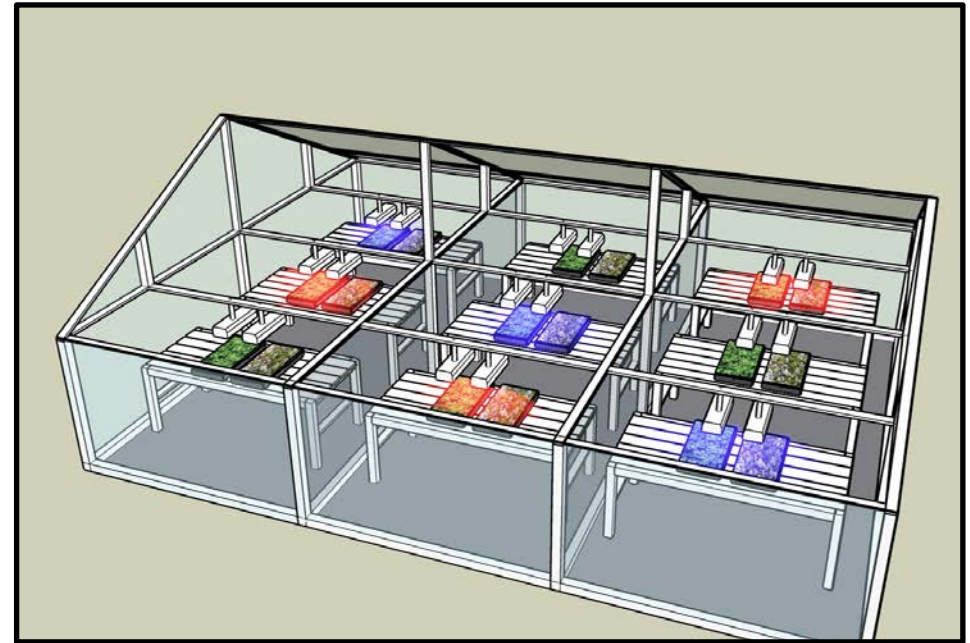
Methodology

Night-time treatments:

- Dark (no night-time light)
- Pure Blue
- Blue+Red+Far-red

4h @15 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$

Night-time DLI: 0.2 $\text{mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$



Commodities from 4 different photoperiod response groups:



**Chrysanthemum
(obligate
short day)**



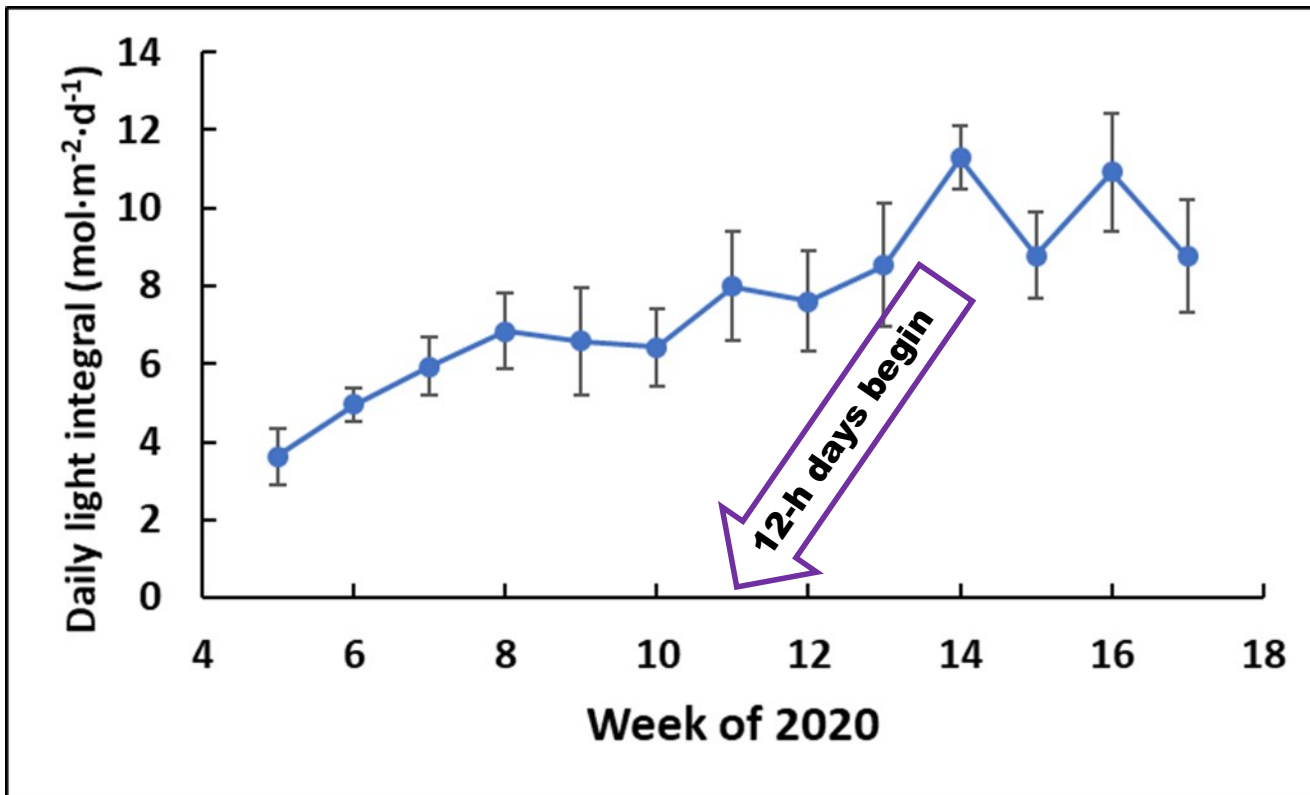
**Geranium
(day
neutral)**



**Calibrachoa
(facultative
long day)**

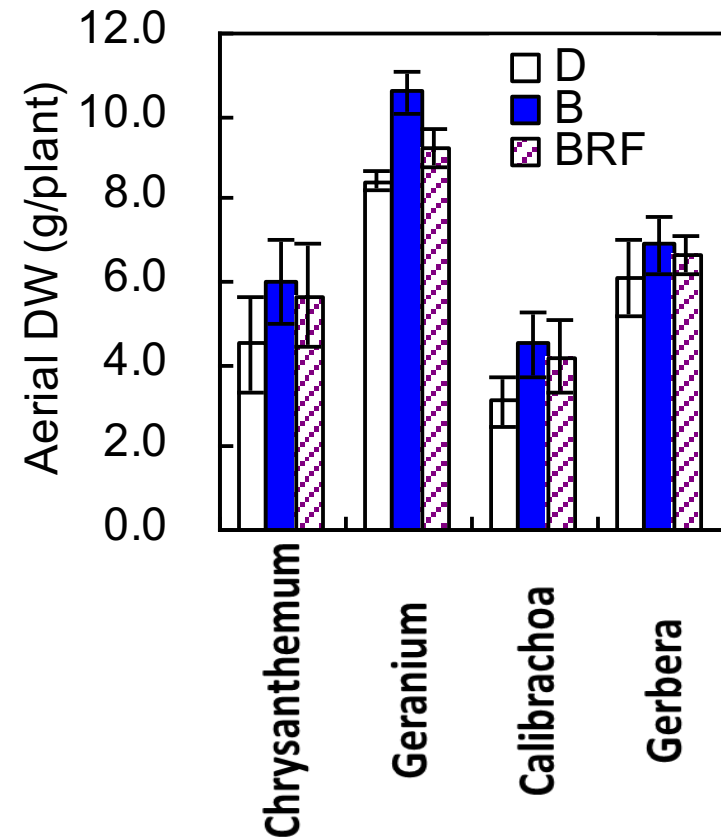
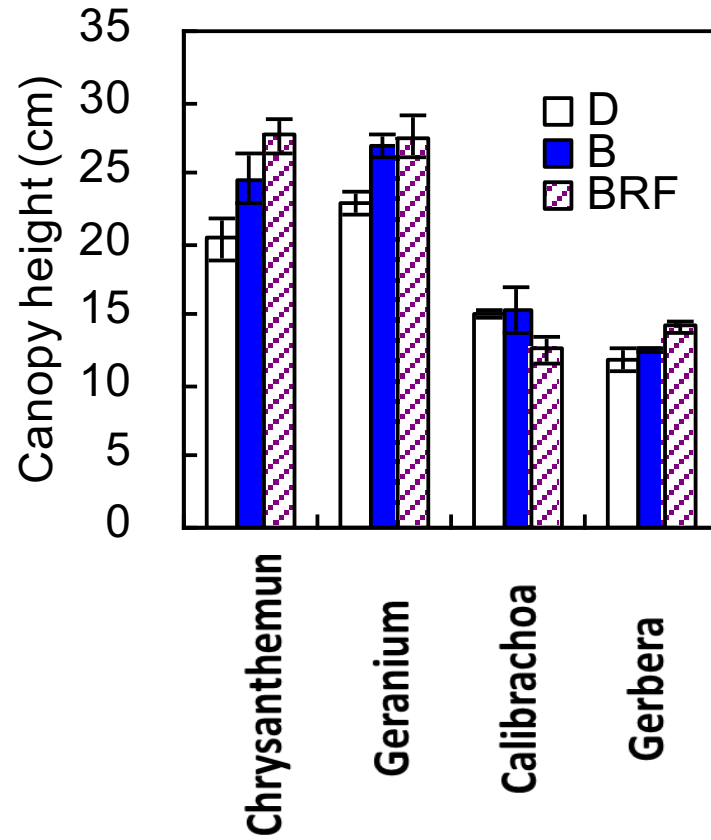


**Gerbera
(facultative
short day)**

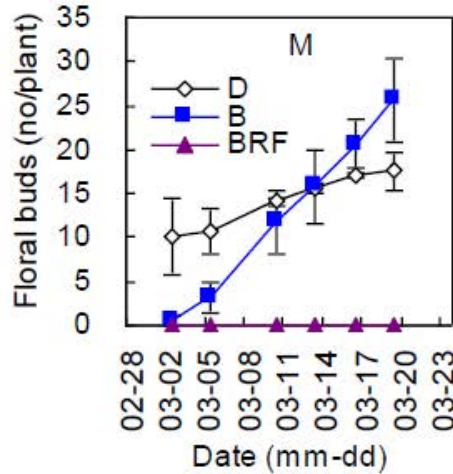
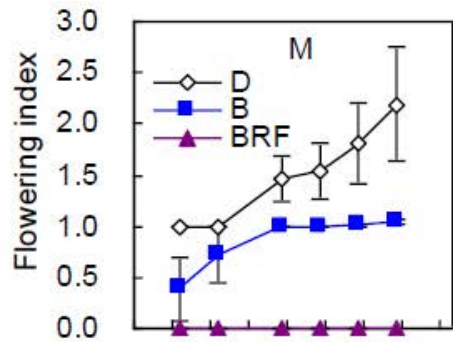


Average natural DLI $\sim 6.7 \text{ mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$

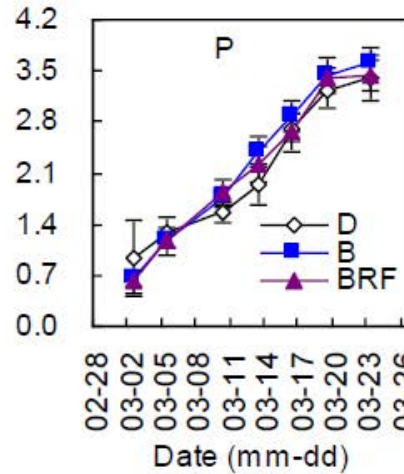
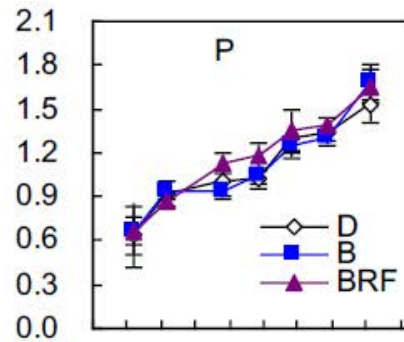
Vegetative Growth



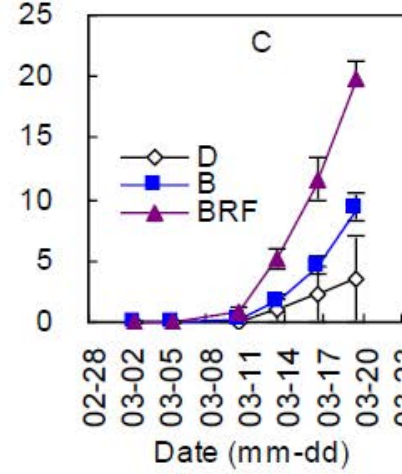
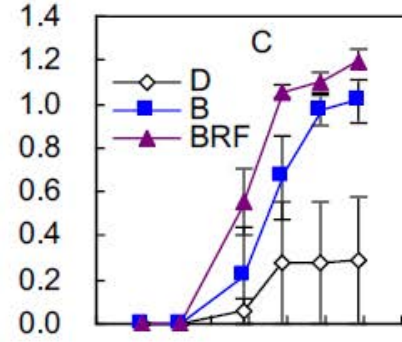
Chrysanthemum (SD)



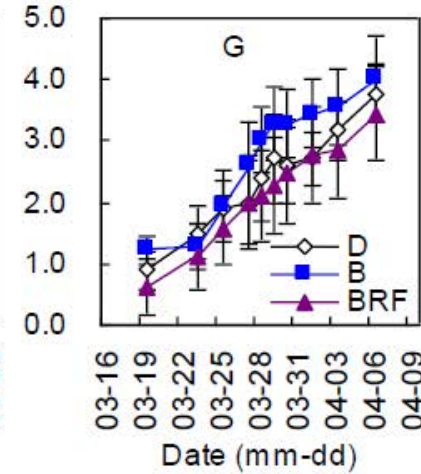
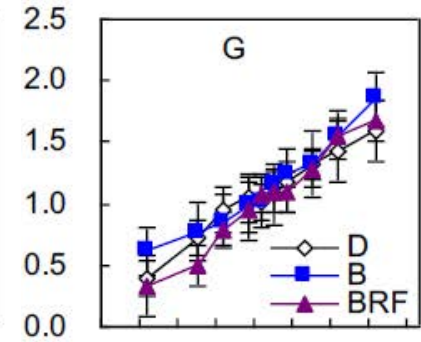
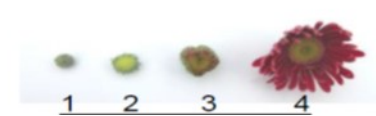
Geranium (DN)



Calibrachoa (FLD)



Gerbera (FSD)





Dark **Blue** **BRFR**

Dark **Blue** **BRFR**

Summary

- EOD spectrum treatments are useful in specific greenhouse production scenarios
 - Promote flowering in LD plants
 - Promoting aboveground DW and branching for cuttings
- In the absence of daylight, only low intensities are required
- Blue LEDs are multi-modal
 - assimilation lighting during daytime
 - morphogenic lighting at night

Acknowledgement

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**Thank
you!**



A. Koornneef & Sons

