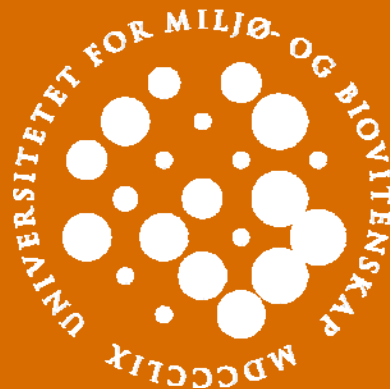


Light quality to regulate plant growth and improve product quality – a summary of results and future work



Light climate manipulations by:

- **Selective plastic films (Solatrol)**
- **Greenhouse covering material**
 - UV-B transmitting greenhouse cover (F-clean)
- **LED light**

Quality?

- Shoot elongation – plant morphology
- Flowering time and flower number
- Storability/postharvest life
- Internal quality
 - Content of vitamin C
 - FRAP (antioxidant capacity)
 - Anthocyanins
 - flavonols
 - Phenols



Experiments/trials

jan 2009- april 2010

- Storability and quality of cucumber fruits produced with LED interlighting (Solberg gartneri AS)
- Solatrol on petunia morphology and flowering
- Red and Blue LED on petunia morphology and flowering
- Green/blue LED on stomata function of roses
- Andersens gartneri (F-clean) effects of UV-B on growth and morphology
- Comparasion LED, HPS, mix LED HPS
 - Roses
 - Poinsettia
 - Lettuce
 - Strawberry
 - Cucumber/tomatoes -small plants

Interlighting with LED

- Solberg gartneri AS
 - Phillips LED
 - Red
 - Blue



Foto: C. Rodriguez

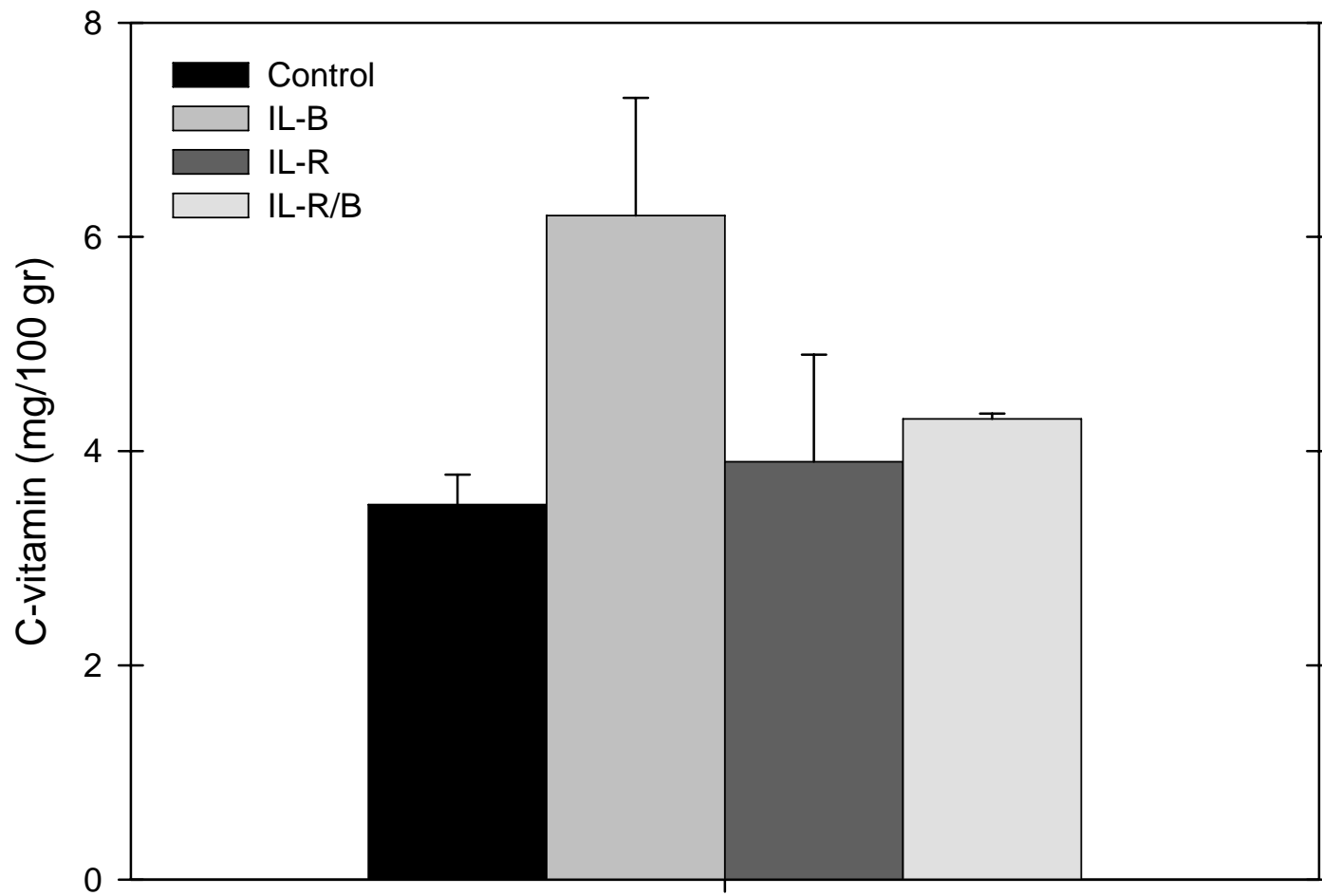
www.lighting.philips.com

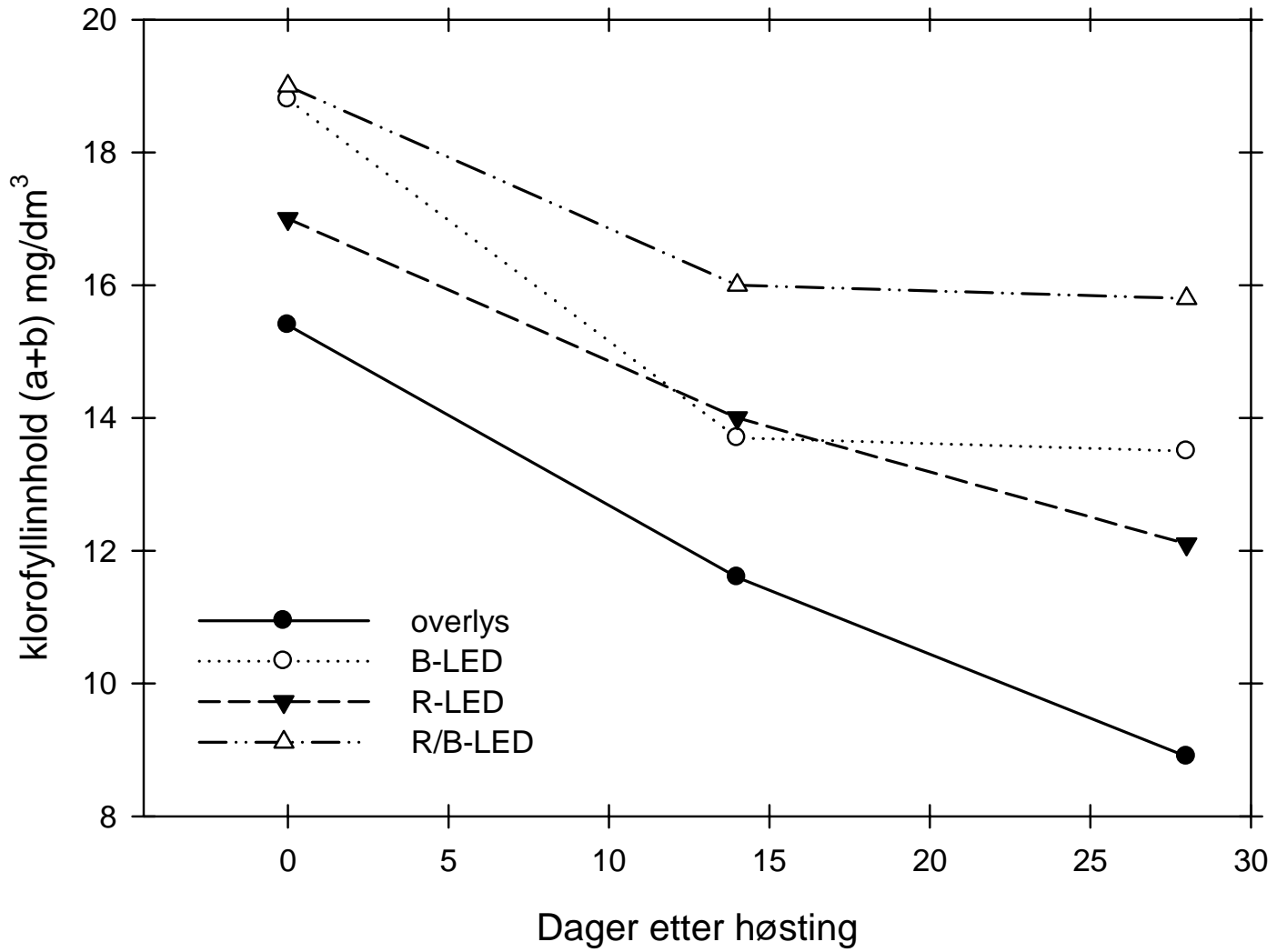
Interlighting experiment:

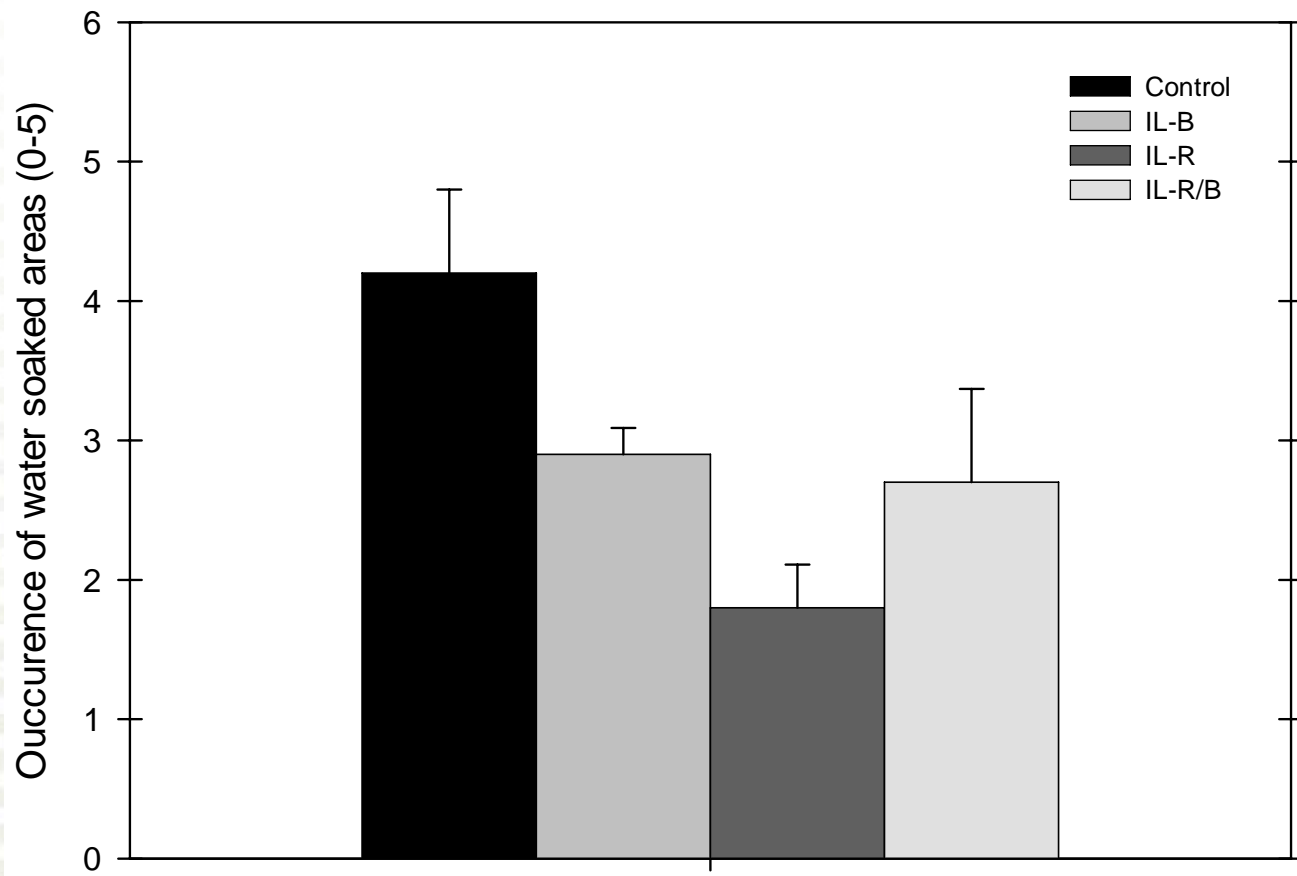
- Overlighting 20 hr, 600 W HPS with an installed effect of 85 W ·m⁻².
- Interlighting 20 hr, with an installed effect of 30 W ·m⁻².
 - red diodes (600-700 nm)
 - blue diodes (400-500 nm)
 - Combination of red and blue diodes (70/30),
- Harvest week 14, stored 10 °C in darkness.
- Content of vitamin-C, acids, sugars (%) and pH measured right after harvest
- Content of chlorophyll (a + b) measured right after harvest and after 2 and 4 weeks of storage



| Treatment | Sugar content (%) | Acids (%) | pH |
|------------------|-------------------|-----------|-------|
| Control (HPS-TL) | 2,7 a | 0,070 a | 5,9 a |
| IL-R | 2,6 a | 0,074 a | 6,0 a |
| IL-B | 3,2 b | 0,076 a | 5,9 a |
| IL- R/B | 2,9 a | 0,062 a | 6,0 a |









OL

OL + IL

Conclusions

- IL-LED interlighting improves external and internal quality of cucumber fruits
- IL-LED interlighting improves storability of cucumber fruits
 - Combination of R and B resulted in the best storability but the differences were small
- IL-B enhances sugar content and vit-C content

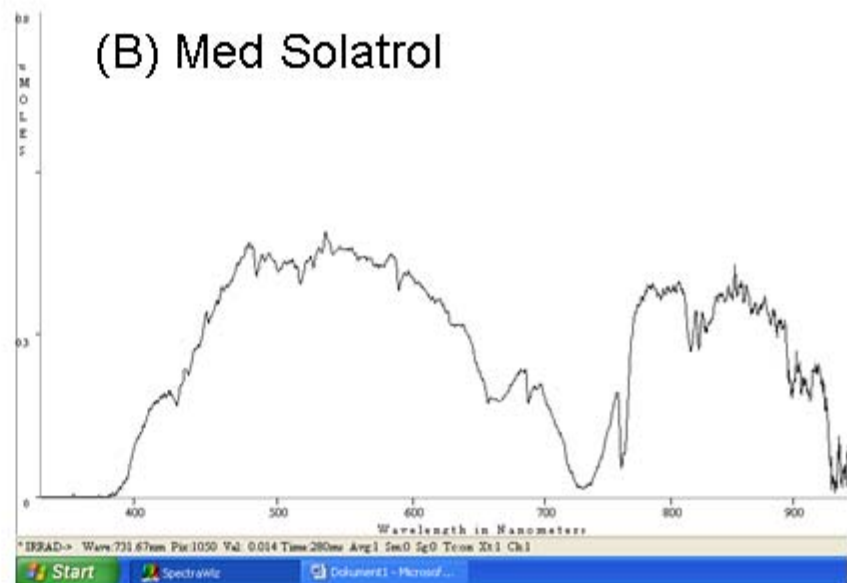
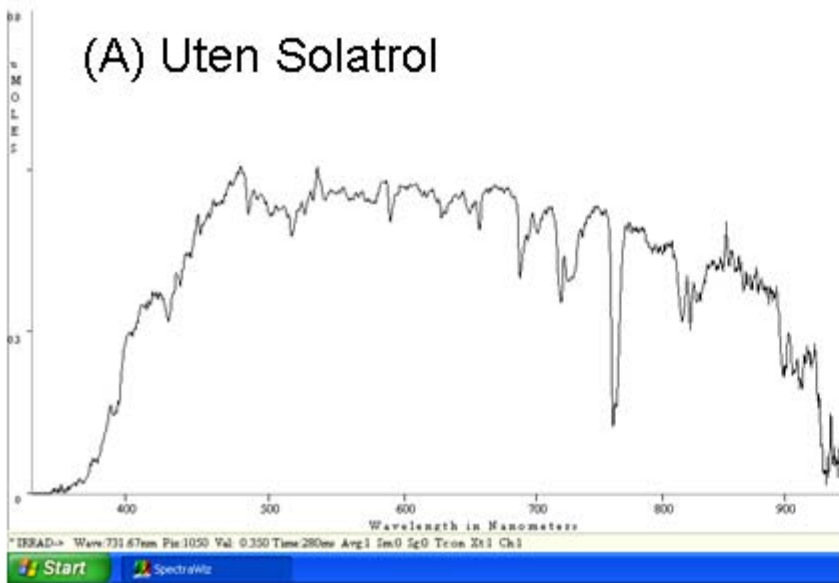


Selective plastic film

- Experiment with Solatrol®
 - petunia



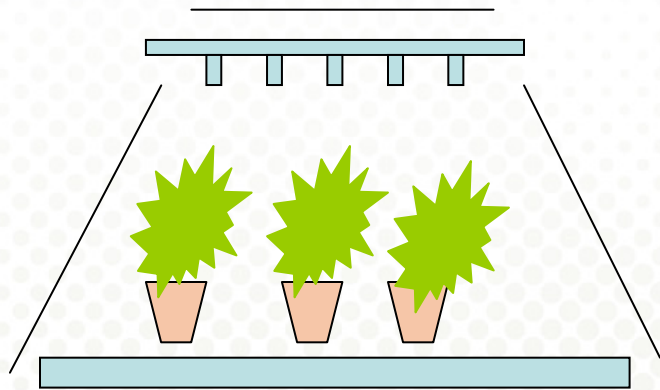
www.bpiagri.com



| | <u>'Tidal Wave Silver'</u> | | <u>'Mambo Formula Mixture'</u> | |
|-----------------------------|----------------------------|-----------|--------------------------------|------------|
| | - Solatrol | +Solatrol | -Solatrol | + Solatrol |
| Plant height (cm) | 32,6 | 16,8 | 11,6 | 8,3 |
| Numbers of flowers and buds | 52,0 | 25,4 | 23,0 | 16,1 |



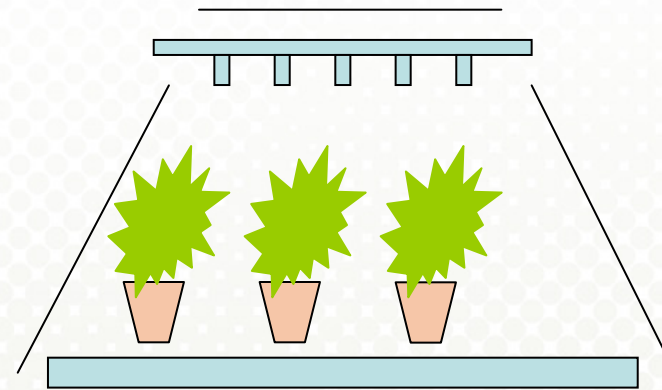
LED in combination with solatrol



polyethylene + agryl

30% reduction in
irradiance

Red og Blue LED



Solatrol

30% reduction in
irradiance

Red og Blue LED



Control



Red LED



Blue LED



Conclusions

- Solatrol suppress elongation and flower initiation
- Yearly variation, interaction with irradiance
- Red LED under solatrol induced very compact plants
- Blue LED enhances flowering and branching
- Due to the strong reduction in irradiance, not very useful in commercial production

F-clean, Andersen Gartneri

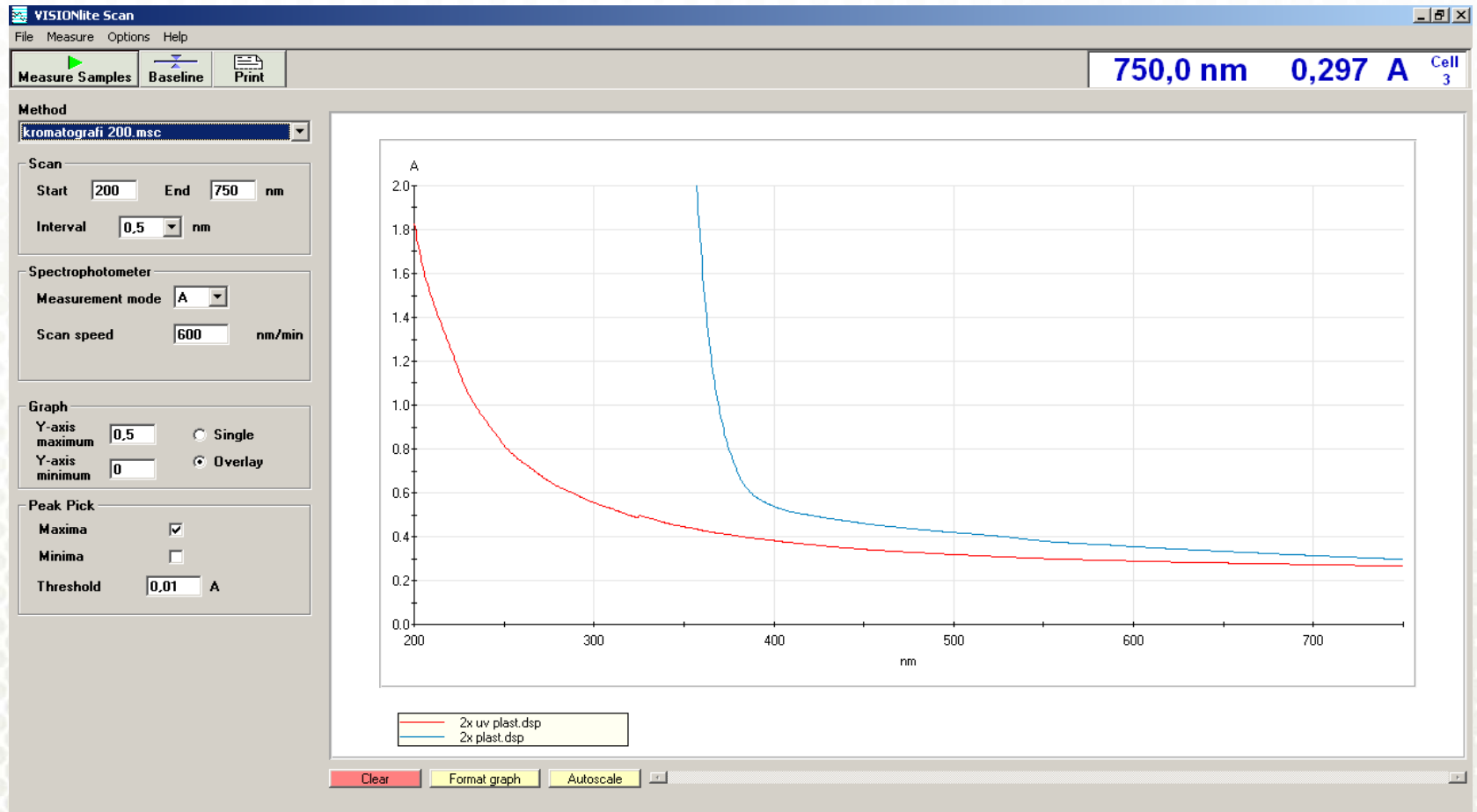




Photo: Staffan Bengtson



Photo: Staffan Bengtson

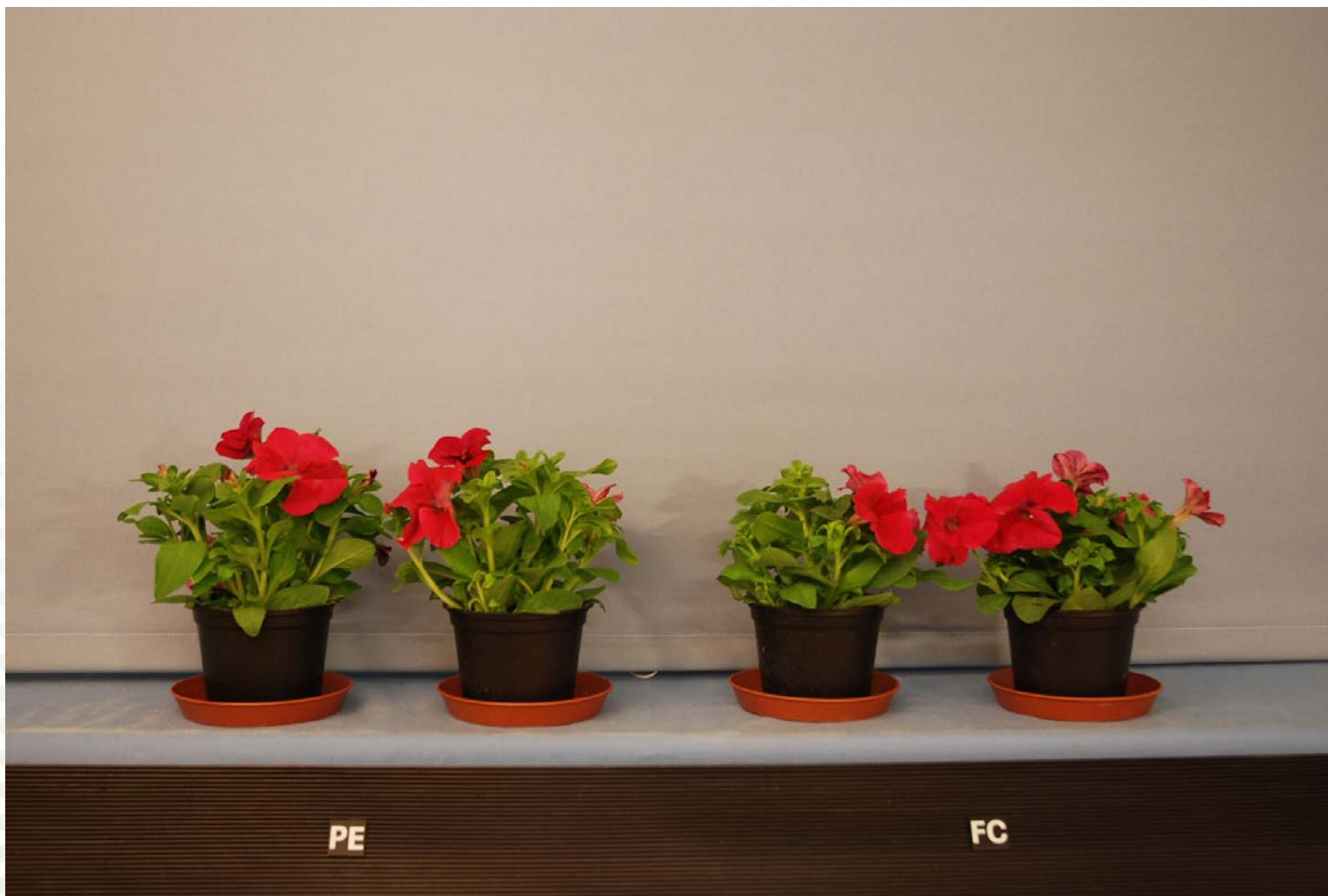


Photo: Staffan Bengtson



Photo: Staffan Bengtson



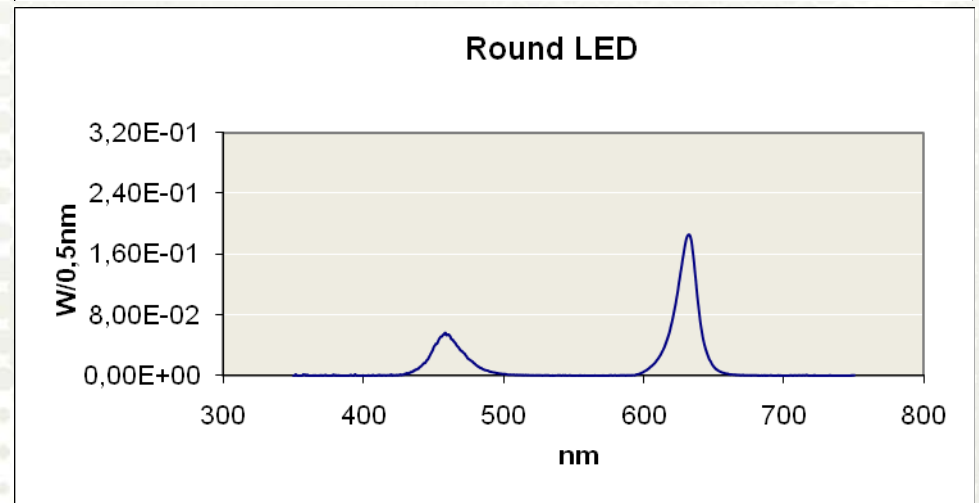
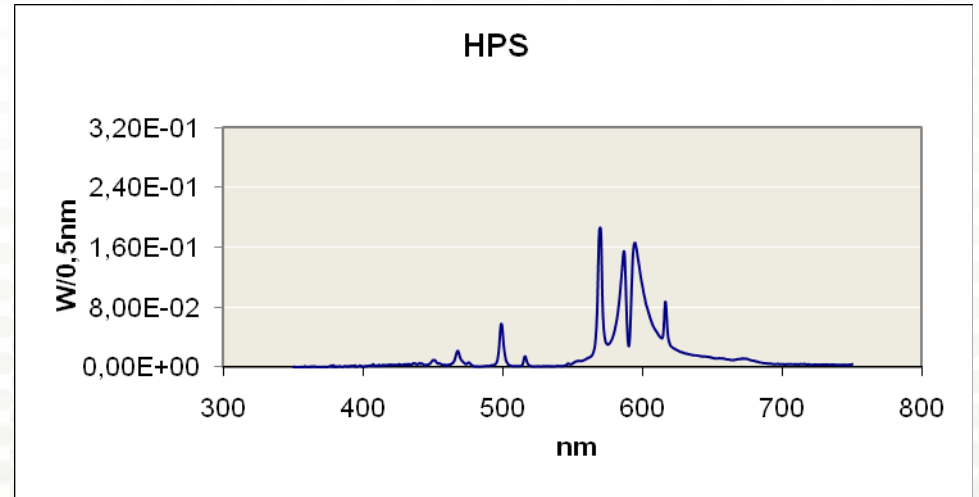
Photo: Staffan Bengtson



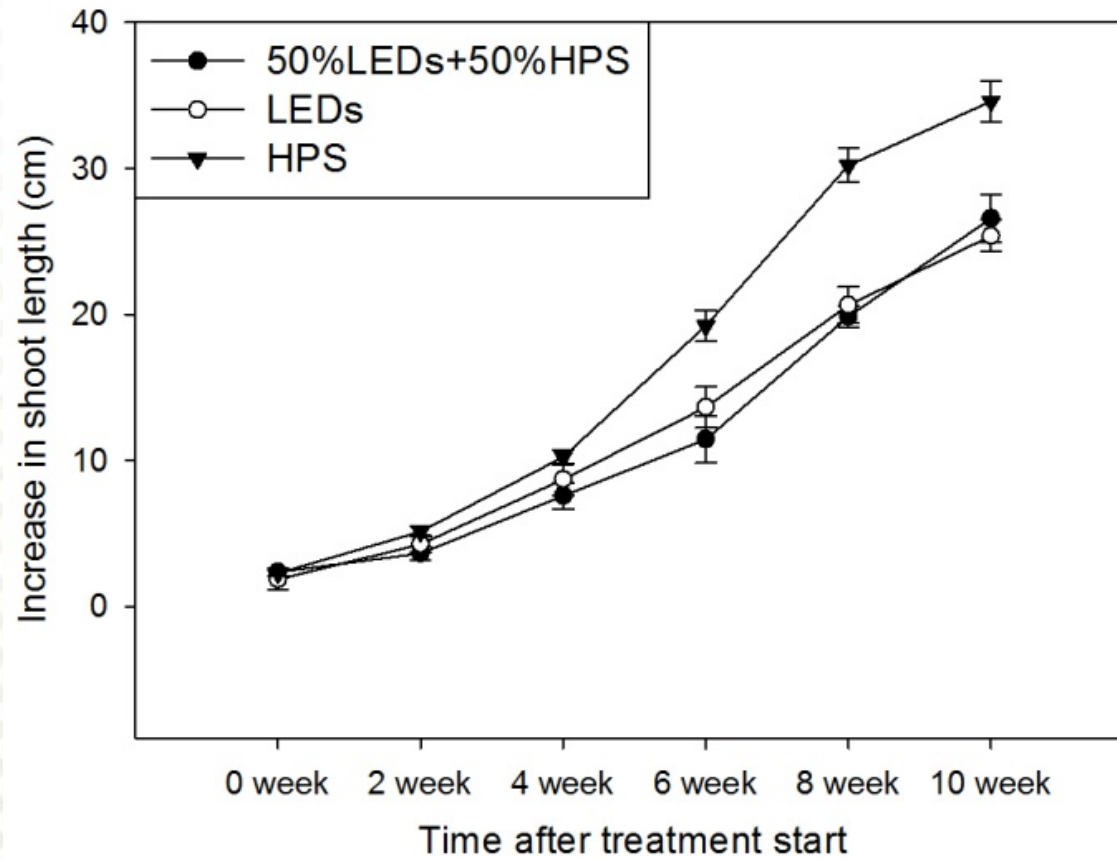
Photo: Staffan Bengtson

LED light - HPS

- Greenhouse
- $100 \mu\text{molm}^{-2}\text{s}^{-1}$
- 20 hr lighting
- 20-21°C
- 70% RH
- 800 ppm CO_2

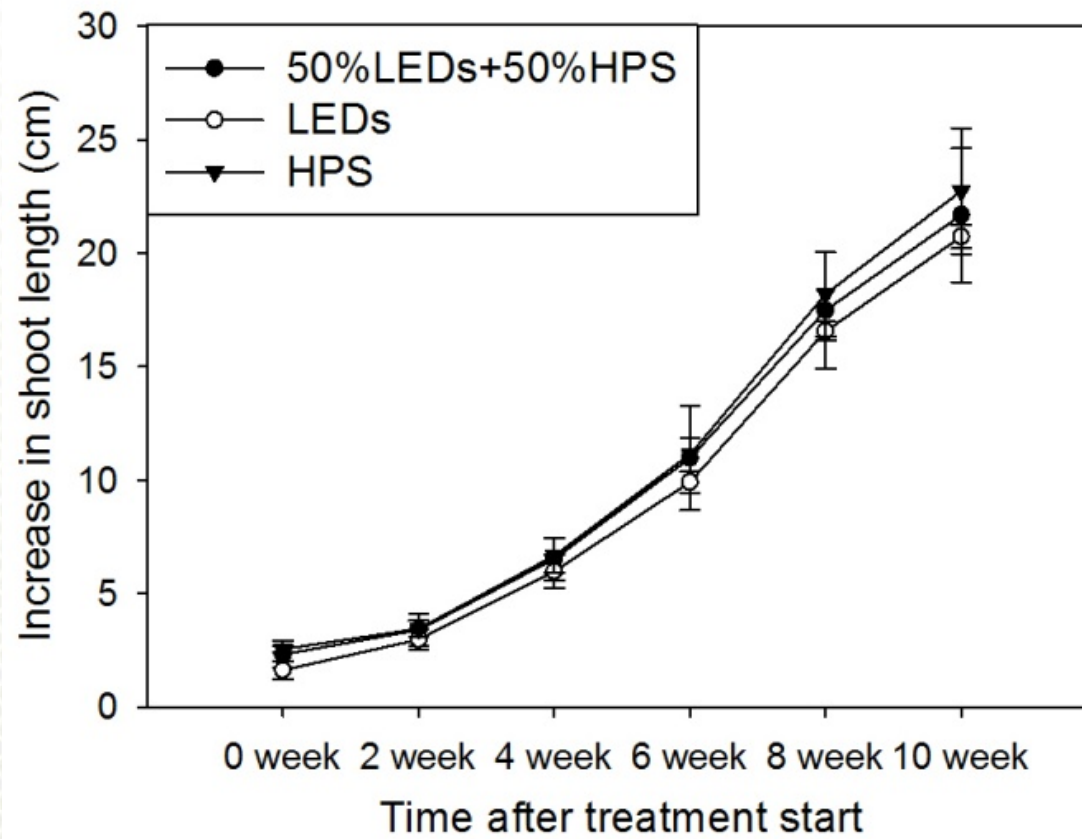


Poinsettia 'Advent red' – under SD

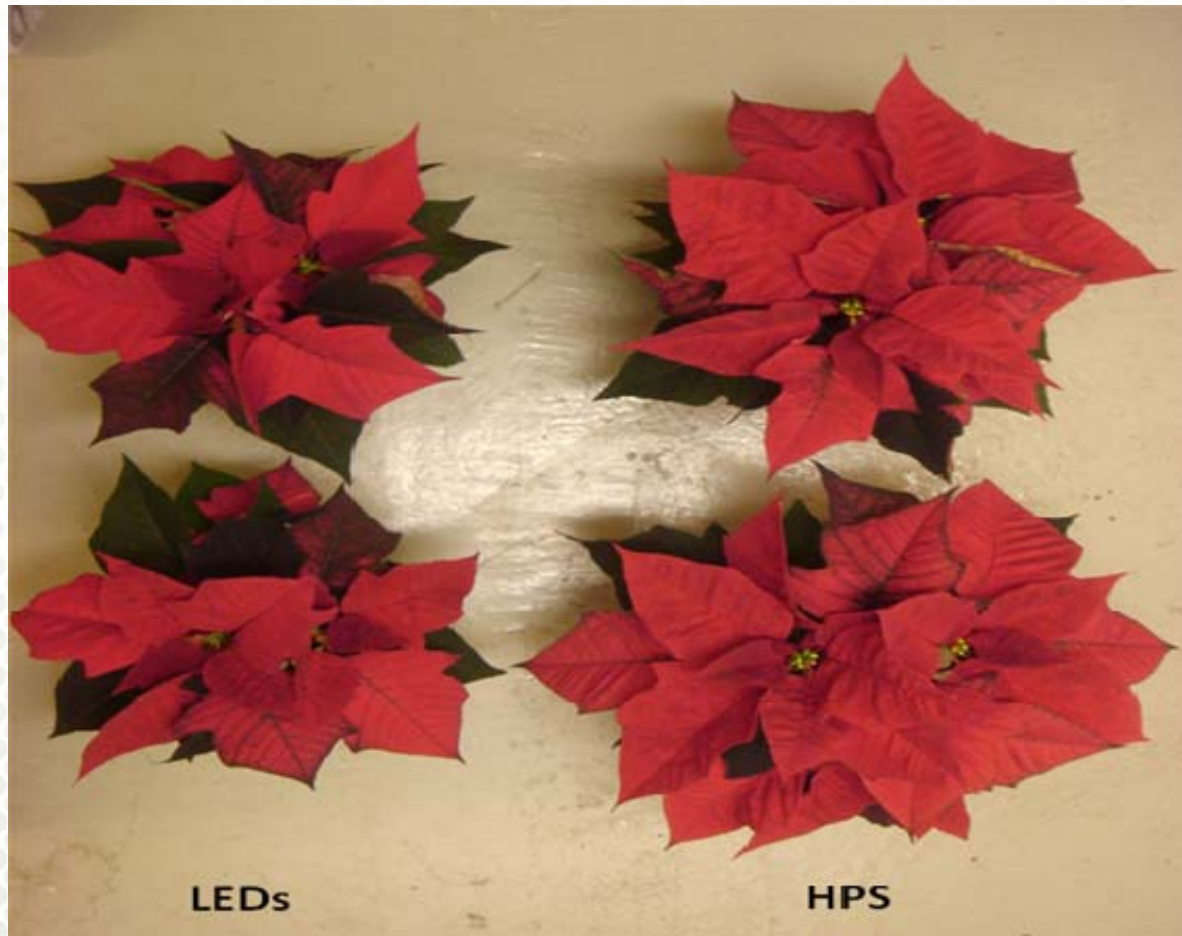


Goutam, 2009

Poinsettia 'Christmas Eve' – under SD



Chamber exp. Poinsettia `Advent red`



Greenhouse experiment with lettuce

| CV | FW | | FRAP μmol/l | | Phenoles (mg GAE/100 gr) | |
|---------|------|------|----------------|-------|-----------------------------|------|
| | LED | HPS | LED | HPS | LED | HPS |
| Carmoli | 15,0 | 42,6 | 1450,8 | 452,4 | 145,7 | 57,2 |
| Frilice | 16,8 | 28,1 | 338,0 | 155,7 | 35,8 | 26,8 |
| Lollo | 14,7 | 44,0 | 357,3 | 166,1 | 42,6 | 28,1 |

Christopher R, 2009



Photo: Ida Hagen



Photo: Ida hagen

Future Plans 2010

- Chamber experiments with LED and UV-B
 - Roses
 - Lettuce, Blue, UV-A, UV-B (Christopher August 2010)
 - Pea, mutants
- LED on Poinsettia (repeat from exp. 2009) PhD student: aug/sept 2010)
 - EOD - Red light
 - Gibberellin measurements (Project: cost effective, environmentally- and health-friendly production of poinsettia with improved ornamental value)
- Andersen, Poinsettia cv, Sept/Dec. 2010
 - Morphology
 - Keeping quality (cyathie drop, botrytis, bract necroses etc.)

