



Smartgreen

PCS Ornamental Plant Research

Trials in MLS

Past trials

- Cultivation of indoor plants, e.g. *Chlorophytum*, several *Calathea* species, *Zamioculcas*...
- Germination of *Primula* seeds
- Rooting of cuttings e.g. *Chrysanthemum*, *Ilex sp.*, *Rhododendron sp.*, *Azalea japonica* & *Camellia*
- Cultivation of several exotic indoor plants (Bromeliads, *Tillandsia*, *Clusia*, *Nepenthes*, *Calathea sp.*, ...)
- Hardening of bamboo

Current trials

- Cultivation of *Amaryllis*
- Hardening of bamboo

Hardening of tissue culture plants

- 3 treatments:

- 40 $\mu\text{mol}/\text{m}^2.\text{s}$
- 80 $\mu\text{mol}/\text{m}^2.\text{s}$
- 120 $\mu\text{mol}/\text{m}^2.\text{s}$

=> Improved quality (color, staining, compactness)?

- 14 different plant species

- Bromeliads (i.a. Vriesea, Guzmania, ...), Aloe vera, Tillandsia, Nepenthes, Echeveria, Clusia, Philodendron, Dieffenbachia, Calathea





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Echeveria

40 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



80 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



120 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



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Nepenthes

40 $\mu\text{mol}/\text{m}^2\cdot\text{s}$

80 $\mu\text{mol}/\text{m}^2\cdot\text{s}$

120 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



Clusia

40 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



80 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



120 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



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Aloe

40 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



80 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



120 $\mu\text{mol}/\text{m}^2\cdot\text{s}$



Rooting of Chrysanthemum

- Influence of 9 light recipes on:
 - Rooting
 - Quality (bud formation, elongation, homogeneity)
- Day length of 16 h
- 4 different cultivars



Rooting of Chrysanthemum

- 9 treatments:

- 100 % blue light

- 50 $\mu\text{mol}/\text{m}^2.\text{s}$

- 75 % blue, 25 % red

- 100 $\mu\text{mol}/\text{m}^2.\text{s}$

- 50

- 25

- 50 % blue, 50 % red

- 50 $\mu\text{mol}/\text{m}^2.\text{s}$

- 25 % blue, 75 % red

- 100 $\mu\text{mol}/\text{m}^2.\text{s}$

- 50

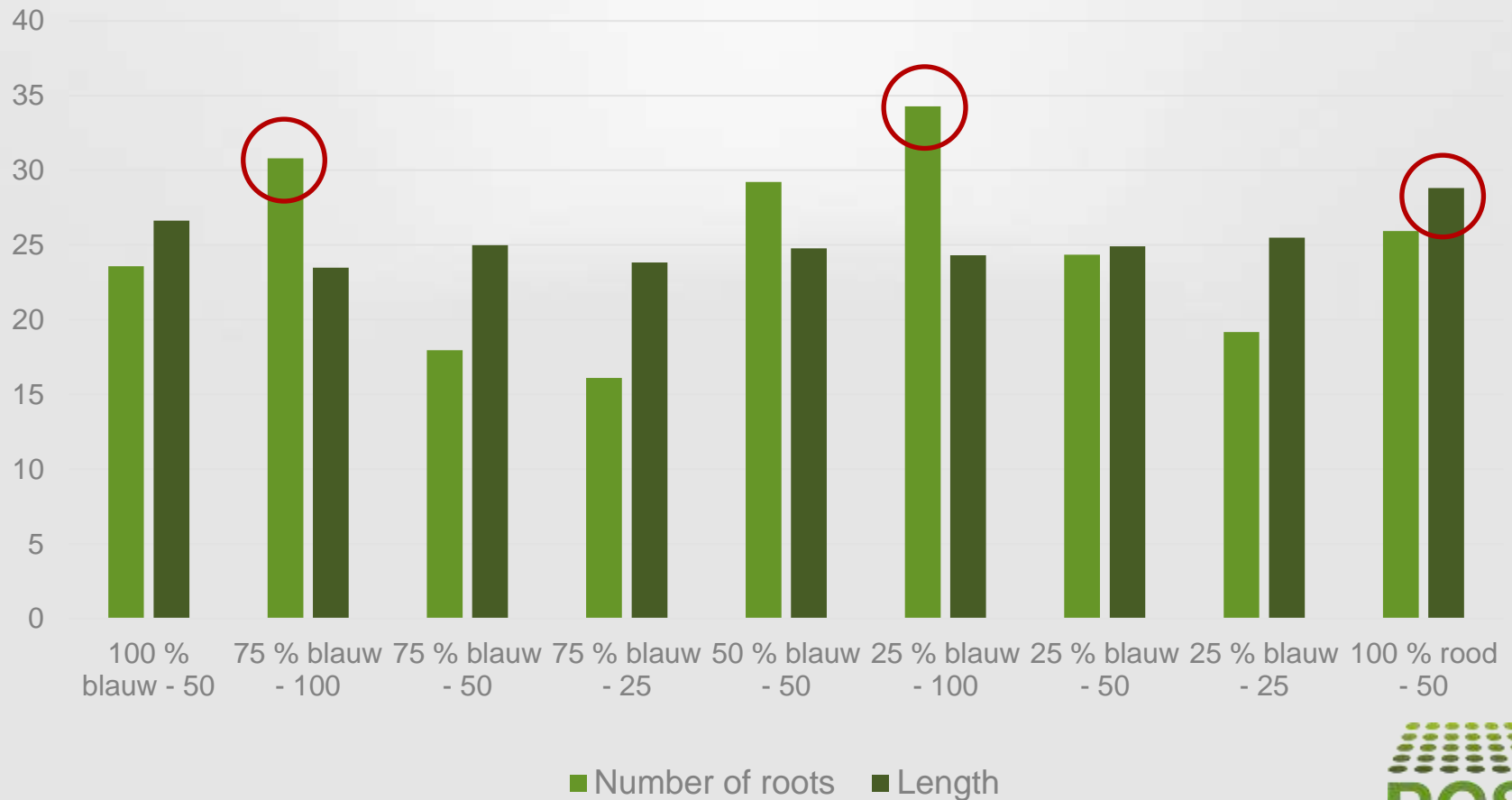
- 25

- 100 % red

- 50 $\mu\text{mol}/\text{m}^2.\text{s}$

Results

• Roots & growth after 3 w.



- Cultivar 1:

- 100 $\mu\text{mol}/\text{m}^2.\text{s}$ = too much

- Smaller, lighter colour, leaves unevenly

- 100 % red = too much elongation

- Best:

- 75 % blue – 25 $\mu\text{mol}/\text{m}^2.\text{s}$

- 25 % blue – 25 $\mu\text{mol}/\text{m}^2.\text{s}$

=> more compact and more uniform than in the greenhouse



Results

- Cultivar 2:

- A lot of bud formation, branching, edges on the leaves
- 75 % blue, 25 $\mu\text{mol}/\text{m}^2.\text{s}$ best combination, but quality of greenhouse grown was better quality



- Cultivar 3:

- Sensible for elongation, growth inhibitors already 2 x used in greenhouse
- Bad quality:
 - 25 % blue, 50 & 100 $\mu\text{mol}/\text{m}^2.\text{s}$
 - 100 % red
- Best:
 - 75 % blue, 25 $\mu\text{mol}/\text{m}^2.\text{s}$ – more leaves, internodes, even batch
 - 100 % blue, 50 $\mu\text{mol}/\text{m}^2.\text{s}$



Results

- Cultivar 4:
 - Best:
 - 75 % blue, 25 $\mu\text{mol}/\text{m}^2.\text{s}$



Conclusion

- Better quality in MLS
- 75 % blue, 25 $\mu\text{mol}/\text{m}^2.\text{s}$ gives the best quality, even though these cuttings have less rooting

Rooting of Chrysanthemum: part 2

- 9 treatments:

- 75% blue, 25 % red

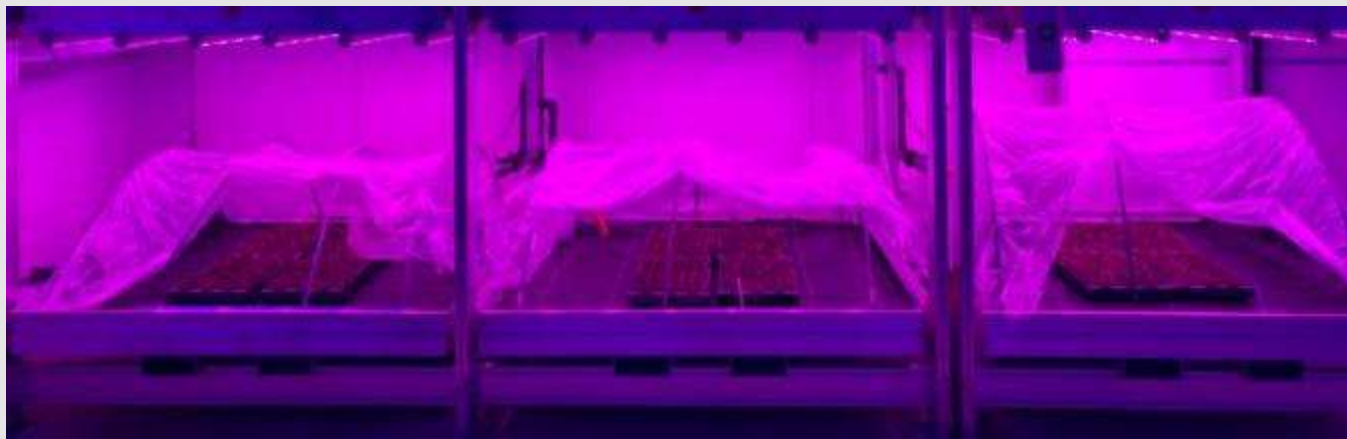
- No FR
- 5 μmol FR
- 10 μmol FR
- 15 μmol FR
- At night: 2 μmol red + FR
- ~ Philips LED flowering lamp

- 25% blue, 75 % red

- No FR
- 5 μmol FR
- 10 μmol FR
- At night: 2 μmol red + FR

Rooting of *Fargesia*

- *Fargesia robusta* 'Pingwu': very difficult to root
- 3 treatments:
 - 80 % red, 20 % blue – 45 $\mu\text{mol}/\text{m}^2\cdot\text{s}$ PAR
 - 70 % red, 20 % blue, 10 % FR – 40,5 $\mu\text{mol}/\text{m}^2\cdot\text{s}$ PAR
 - 80 % red, 20 % blue – 65 $\mu\text{mol}/\text{m}^2\cdot\text{s}$ PAR



Dynagrow trials

- Dynagrow What?
 - Control software for greenhouse lighting based on
 - Assimilation lighting with DLI set point
 - Expected electricity prices
 - Weather forecast (sunlight)
- In cooperation with SDU
- Dynagrow introduced in Oct. '20 @ technical committees

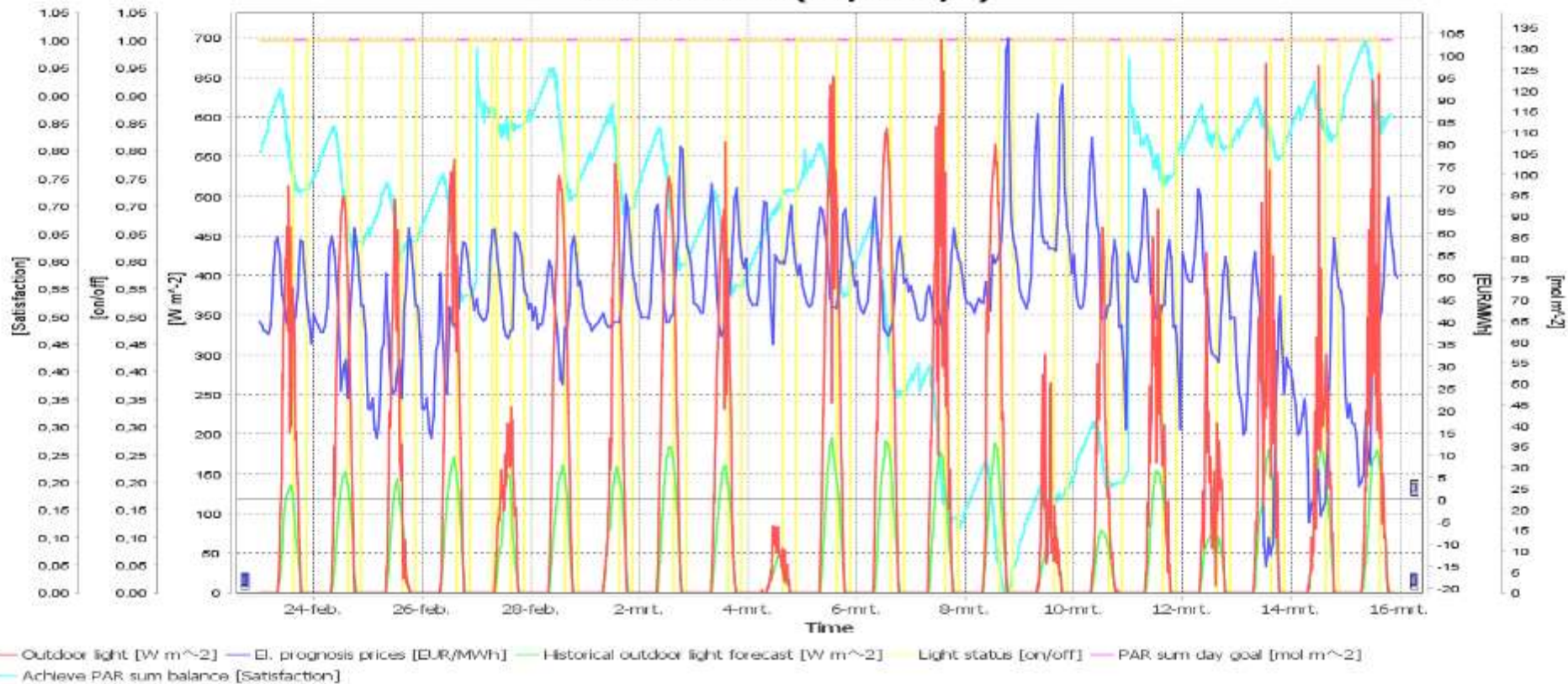
Cut roses

- 2 compartments 116 m² with gutters and double screening
- Hortiled (85 R/5 B/10 W) - 120 $\mu\text{mol}/\text{m}^2\cdot\text{s}$
- 2 cultivars (Avalanche & Jumilia)
- Growth, production, quality under LED
- DLI 22 = No optimisation possible during darker months due to low light levels (lamps + sun light)
- Minimum night of 6h



Dynagrow

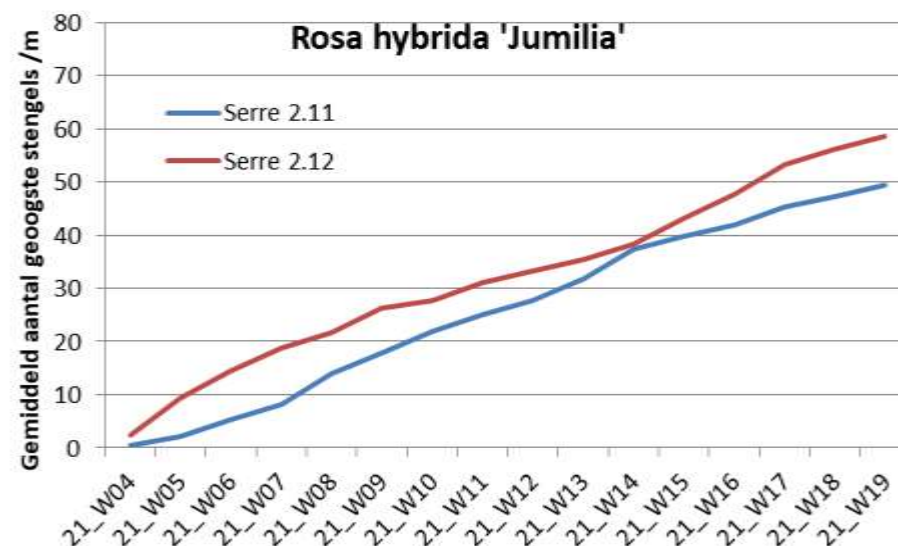
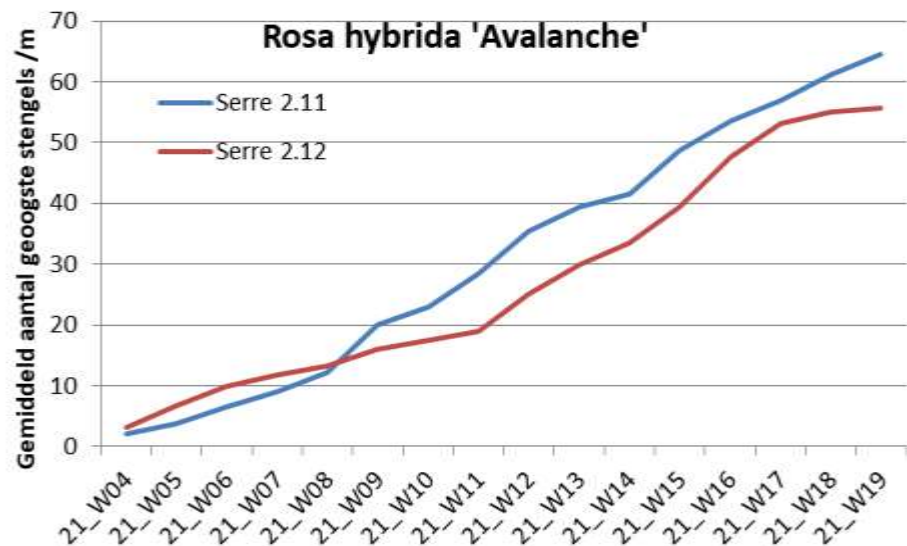
D1 Overview (22/2-15/3)



We need a better light forecast!



Dynagrow



- In April (W13-W16) we saved 20% energy (production results are visible 4-5 weeks later)
- Savings in spring and autumn
- Go further with lower DLI = more optimization
- New experiment will start in September with daily registration of the DLI in the control

Projectpartners

