Response of two *Anthurium andreanum* genotypes to elevated CO_2 concentration

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Purpose of the experiment

- To evaluate if the cost of continuous CO_2 supply in commercial Anthurium cultivation can be paid back by extra production and/ or improved flower quality

Background information

- CO_2 enrichment not a year round practice in commercial Anthurium cultivation in The NL
- mostly related to heat demand in the greenhouse
- efforts in energy saving lead to less heating = less CO_2 supply
- For continuous supply, CO_2 needs to be sourced additionally

Experimental design

- 3 CO_2 levels, each level in 2 compartments
  - No enrichment - outside concentration
  - 500 ppm – enrichment with a maximum of 150 kg/ha.hour
  - 800 ppm – enrichment with a maximum of 300 kg/ha.hour

Experimental design

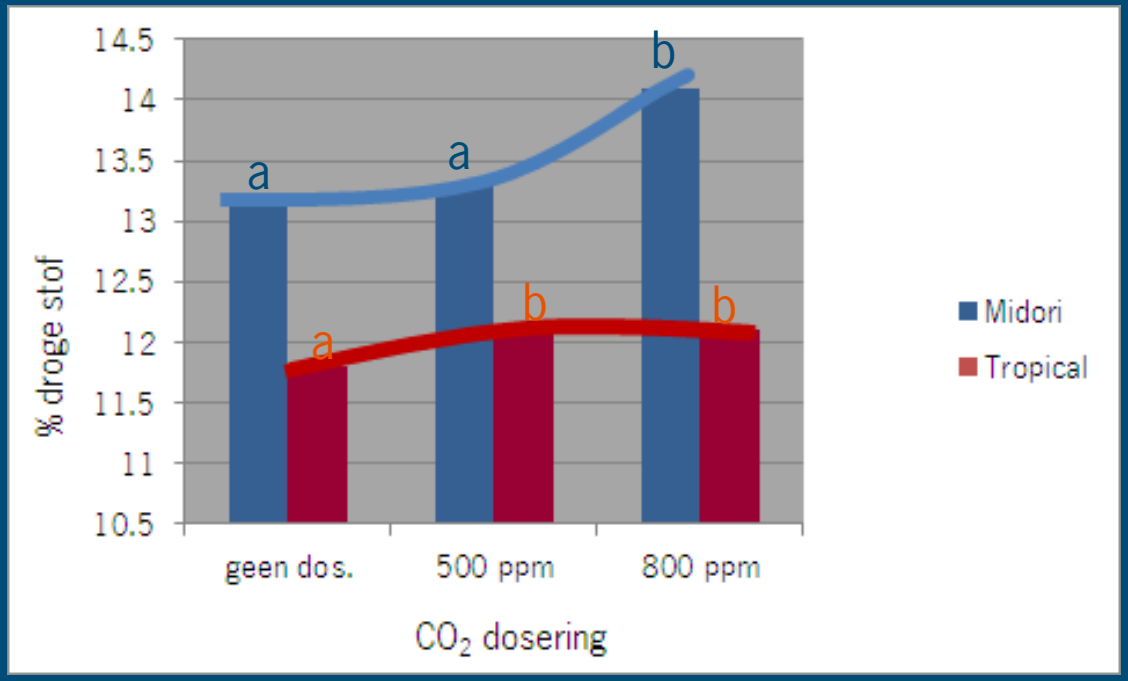
- 2 genotypes
  - Tropical (red)
  - Midori (green)
- Experimental period: January 2010 till January 2011

- Plant density 18 pl / m^2
- Substrate: oasis
- Watering: eb/flow
- Plants productive at start

Measurement plan

- Production and quality
  - Number of flowers, flower fresh weight, stem length, flower diameter
  - Dry matter (4 x)
  - Generation time (time from harvest flower 1 to harvest flower 2)
- Supplied CO_2
- Photosynthesis (3 x)

Results: plant growth



- Dry matter percentage shows the same trend as flower diameter and stem length

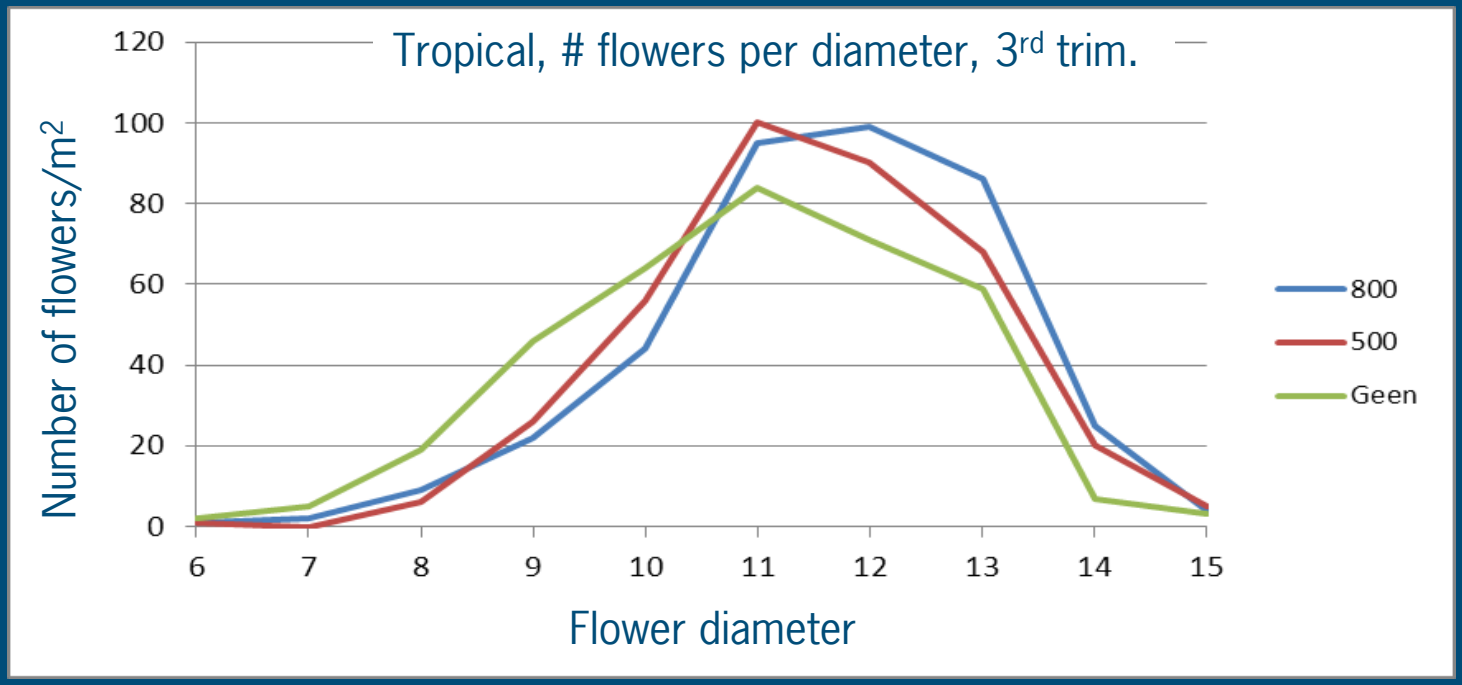
Results: plant growth

- In increase % compared to the ambient level

CO_2 level	Parameter	'Midori'	'Tropical'
500 ppm	Number of flowers	+ 4%	+ 0,9% (ns)
	Avg. flower weight (f)	+ 2,6 % (ns)	+ 6 %
	Flower diameter	+ 0,3 cm (ns)	+ 0,6 cm
	Stem length	+ 1,5 cm (ns)	+ 3,4 cm
800 ppm	Number of flowers	+ 10 %	+ 1,6 % (ns)
	Avg. flower weight (f)	+ 22,5 %	+ 11 %
	Flower diameter	+ 1,5 cm	+ 0,9 cm
	Stem length	+ 4,1 cm	+ 4,7 cm

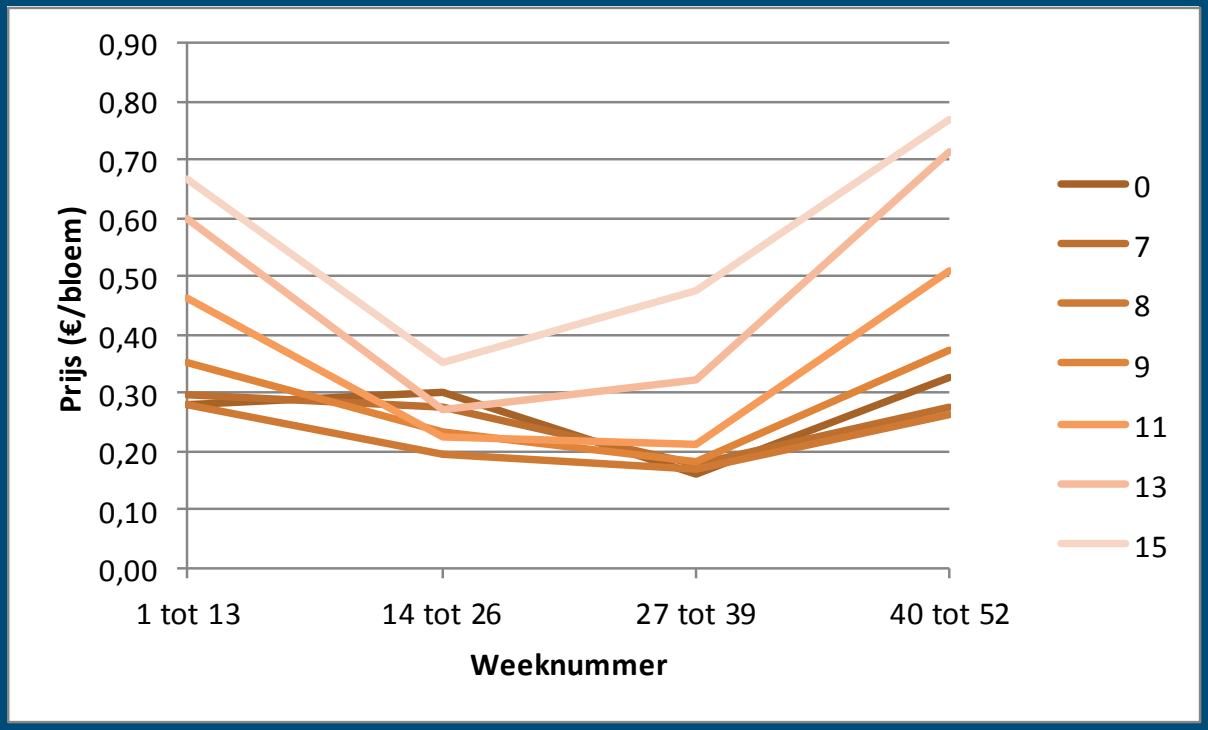
Results

- CO_2 enrichment increases the number of flowers of higher diameter class



Results: economic evaluation

- CO_2 enrichment of 'Tropical' leads to better flower prices
  - flowers > diametres are better paid, also in the in 3rd quarter (no heat demand)



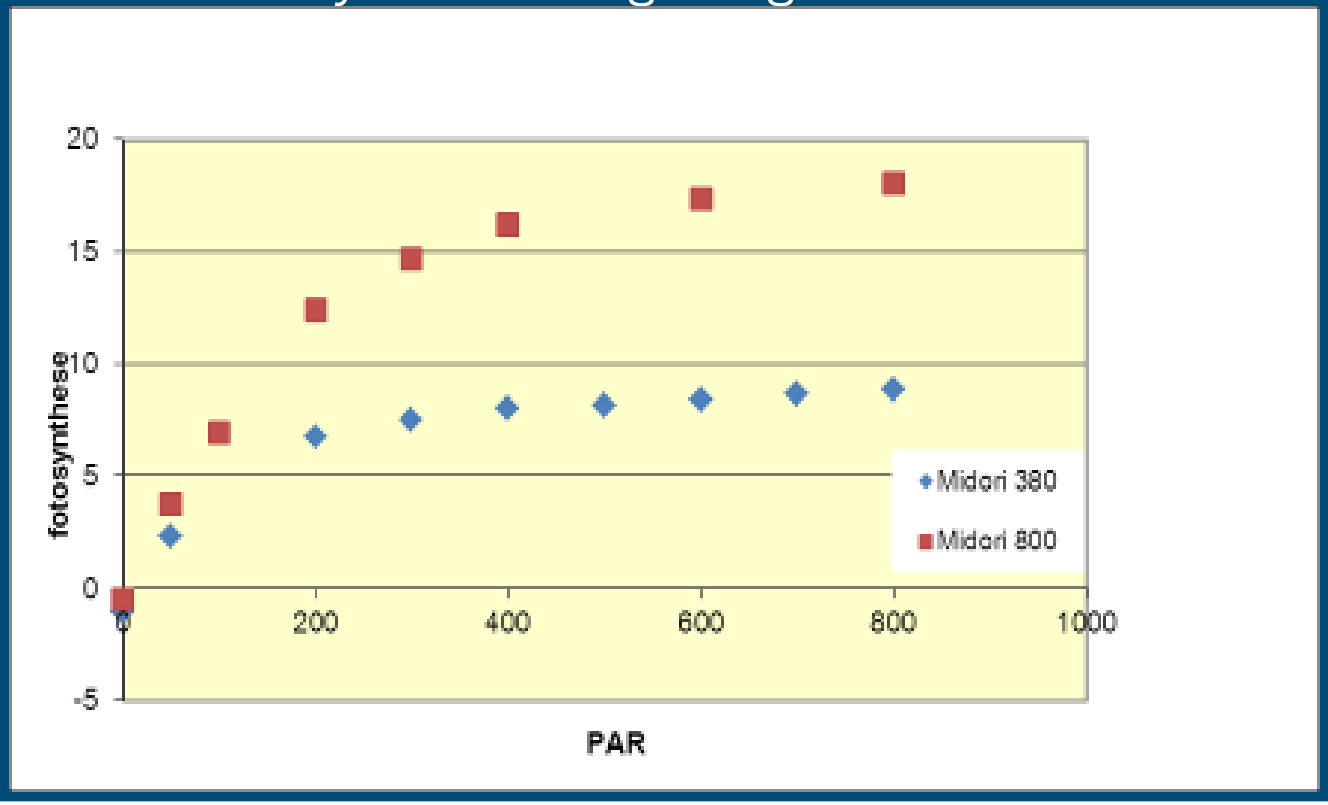
Results: economic evaluation

- Better prices pay the investment in CO_2 back in Tropical
  - Independently of CO_2 source, calculated for the most expensive source

	Production	Income	Extra income	Costs CO_2	benefit
	Flowers/m^2	€/m^2	€/m^2	€/m^2	€/m^2
No CO_2	106.7	37.78			
500 ppm	107.7	40.60	2,83	0,80	2,03
800 ppm	108.4	41.51	3,73	1,69	2,04

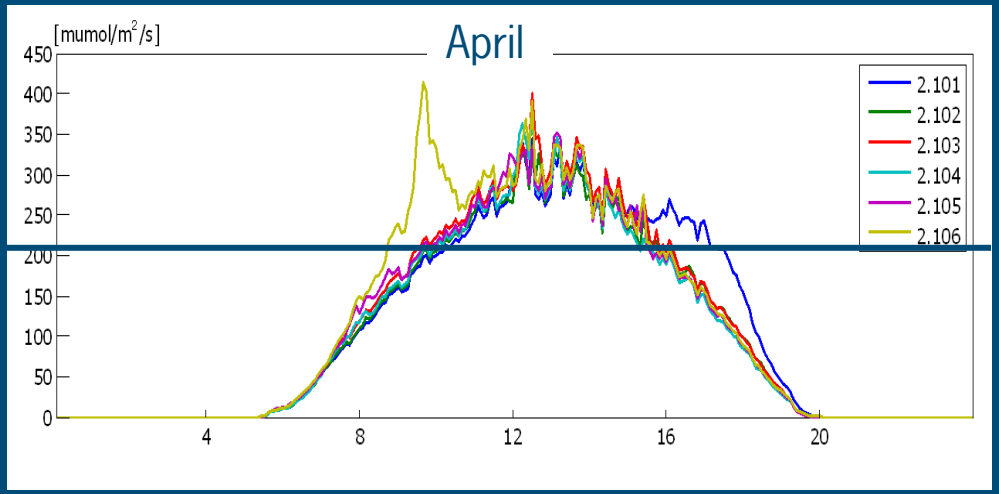
Results: fotosynthesis

- Extra growth Midori result of increased net Photosynthesis at 800 ppm (compared to no enrichment)
  - More fotosynthesis at higher light intensities

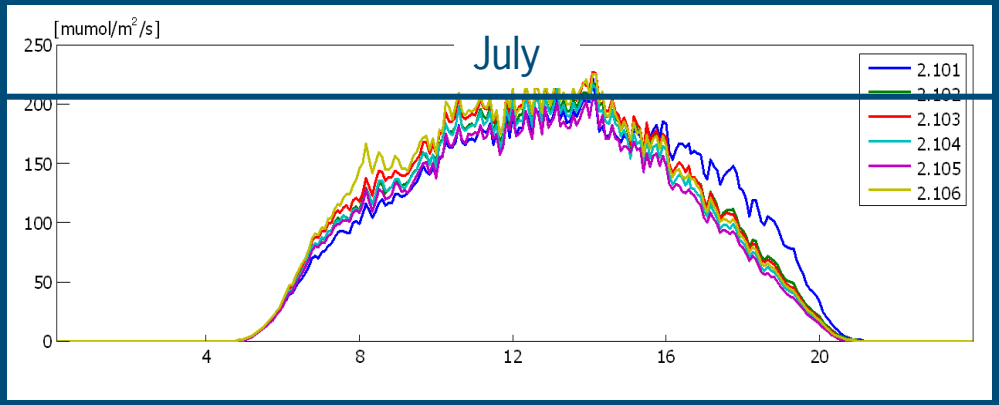


Results: light in greenhouse

- Light intensity in greenhouse limited by whitewash and screens



200 µmol/m²s



200 µmol/m²s

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Conclusions

- CO_2 enrichment increases growth in both cultivars
  (more flowers, higher fw & dw, higher flower quality)
- 'Midori' is more responsive to CO_2 enrichment than 'Tropical'
- For 'Tropical' enrichment with 500 ppm is sufficient, further enrichment till 800 ppm does not improve significantly
- For 'Midori' is enrichment with 500 ppm insufficient, significant growth effects are obtained with 800 ppm
- Improvement of results might be possible if more light is allowed
- The cost of CO_2 enrichment with 800 ppm is paid back for both varieties by the improved production ('Midori') and quality ('Tropical'). 500 ppm is economically feasible for 'Tropical', provided a better price is paid for the bigger diametres.

Thanks for your attention!

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