

# Post-harvest blueing in *Anthurium andeanum* as affected by pre-harvest conditions

Nieves García Victoria and Mary Warmenhoven



# Blueing of Anthurium spatha

- Blueing a serious quality problem in red Anthurium varieties in The Netherlands.
- First signs can show already at harvest, but blueing mostly becomes visible during the trading channel, leading to quality claims.



# Background information

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- In literature, blueing has been related to calcium deficiency in the spatha, and can be solved by adding calcium to the fertigation solution
- Blueing could also related to root pressure (cells fill up with water during the night)

# Background information

- Due to energy saving measures, climate in the greenhouse has changed
- To increase production, the pruning method has changed (young leaves are removed)



# Experimental set-up

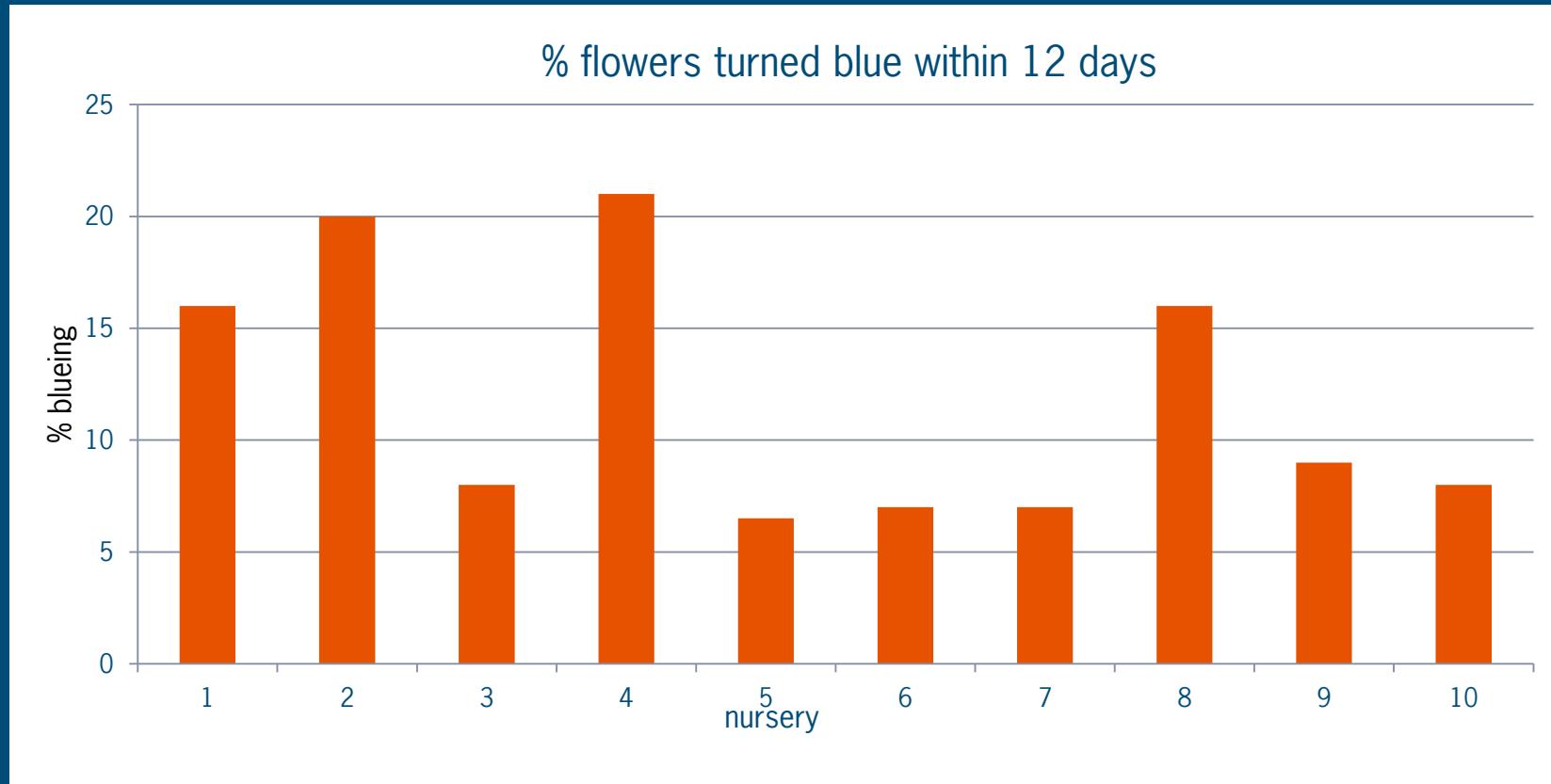
- Phase I: A nursery comparison (10 commercial growers of the variety 'Tropical')
- Phase II: A greenhouse experiment at WUR Greenhouse Horticulture (Bleiswijk)



# Phase I: Nursery comparison

- 10 growers selected, 5 of them with claims from post-harvest blueing, 5 of them without
- Data loggers placed to monitor RH, greenhouse temperature, CO<sub>2</sub>, PAR and substrate temperature; drainwater analysis
- 8 times (October to March), 100 flowers per greenhouse collected (unpacked and dry)
  - Flowers in post-harvest room observed during 12 days
  - after 12 days fresh / dry weight, Ca analysis

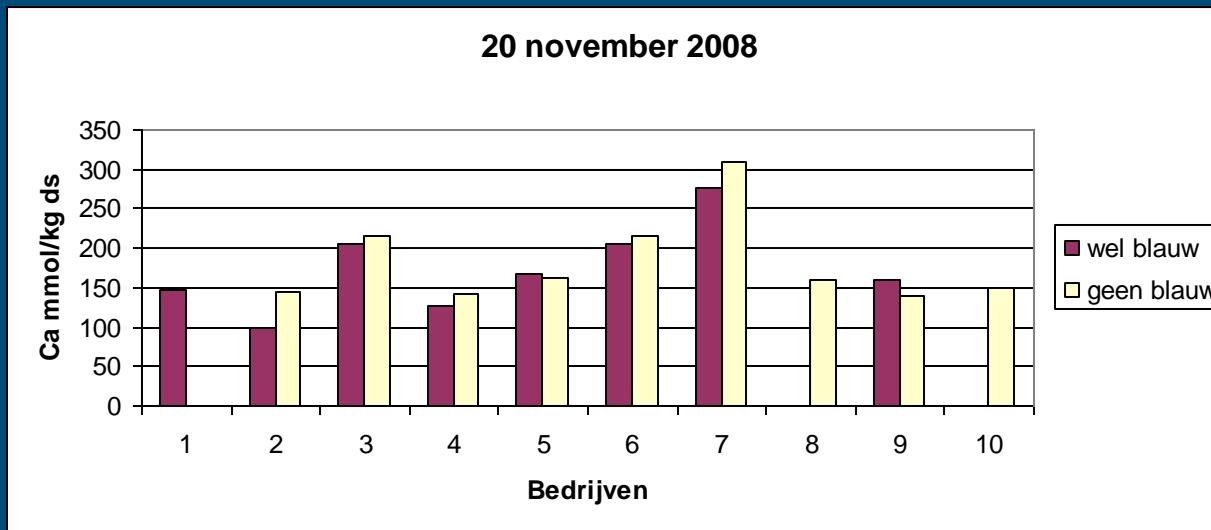
# Results nursery comparison



All 10 growers selected, also those not having claims, had blueing to some extent.

# Results nursery comparison: water/ tissue analysis

- The differences in Calcium content were bigger among growers than within one grower



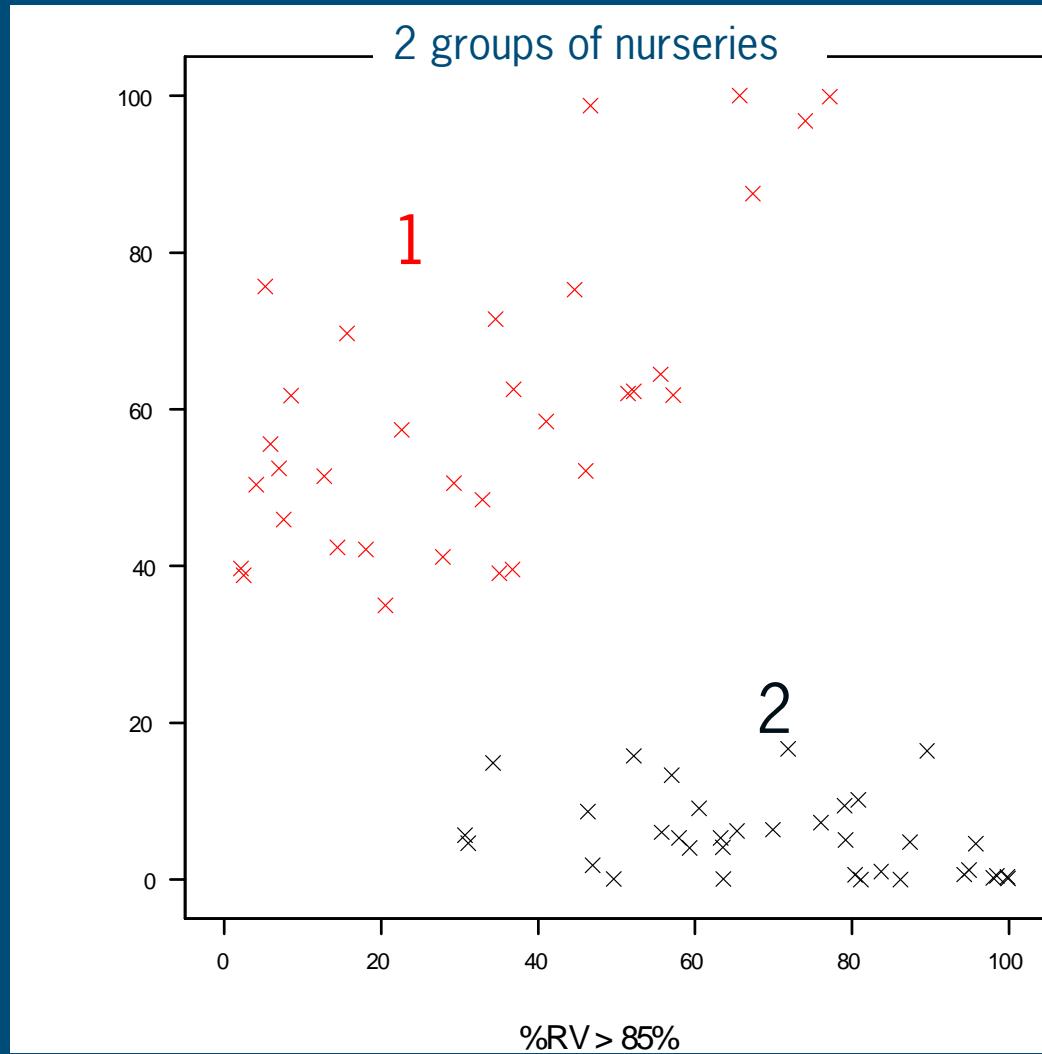
- No consistent relation between nutrients and blueing

# Results nursery comparison: climate vs blueing

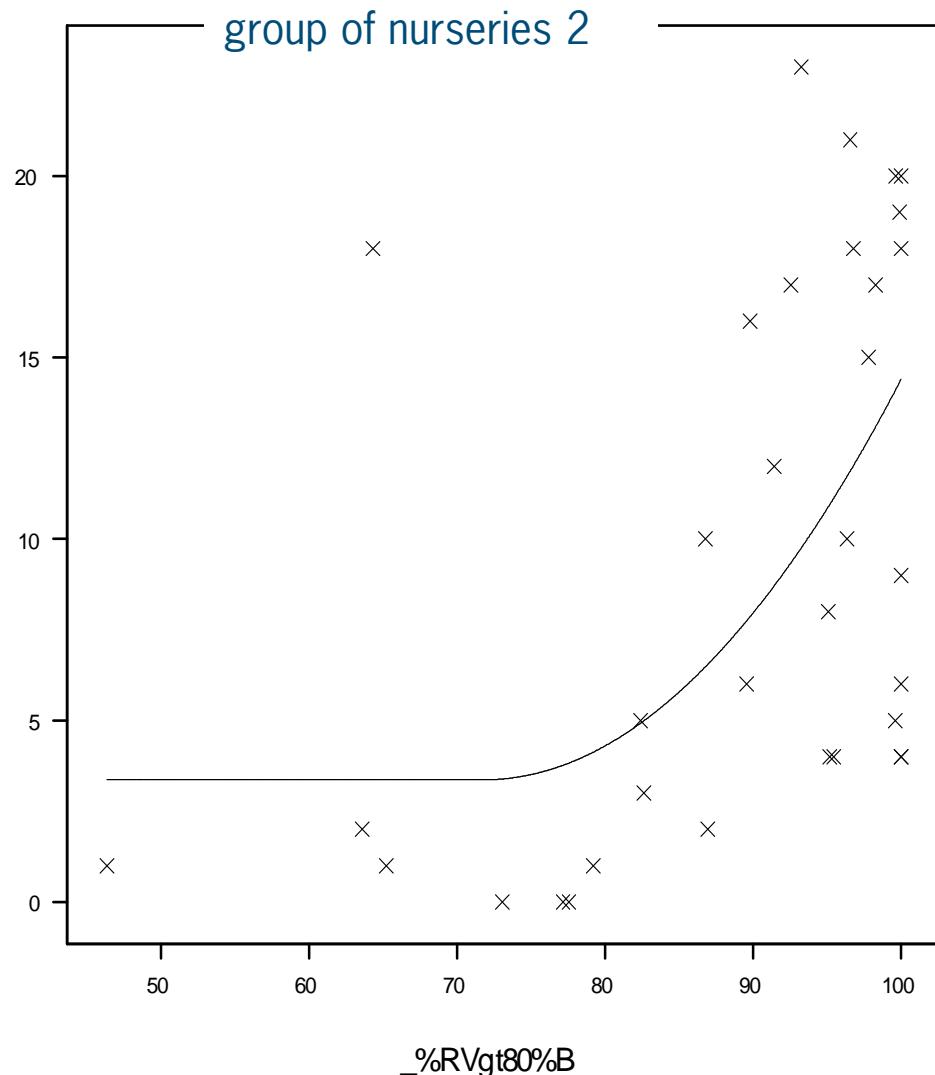
- Relation between climate (6 weeks prior to harvest) and blueing:
  - Frequent RH > 80%
  - Frequent CO<sub>2</sub> > 700 ppm



# Results nursery comparison: climate vs. blueing



# Results nursery comparison: climate vs. blueing



- The chance of spatha blueing increases when more than 80% of the time,  $\text{RH} > 80\%$

# Results nursery comparison: climate vs blueing

% blue flowers when	% time that CO <sub>2</sub> > 700 ppm		
	0 - 10	10 - 20	> 20
% time RH > 85%			
0 - 35	*	7.3	15.4
36 - 65	1.5	8.4	10.2
> 65	12.4	13.5	21.5

# Conclusions nursery comparison

- Spatha blueing is a problem in all participating 'Tropical' growers, even those that never had claims before.
- The calcium contents in the flowers of blue and no-blue flowers are very similar.
- A good correlation is found for half of the nurseries between the frequency of relative humidity in the greenhouse > 80% and the blueing percentage
  - Four of the 5 nurseries used a plastic foil screen for energy saving
- High frequency of CO<sub>2</sub> concentration >700 ppm enhanced the effects of high RH

# Phase II: Greenhouse experiment

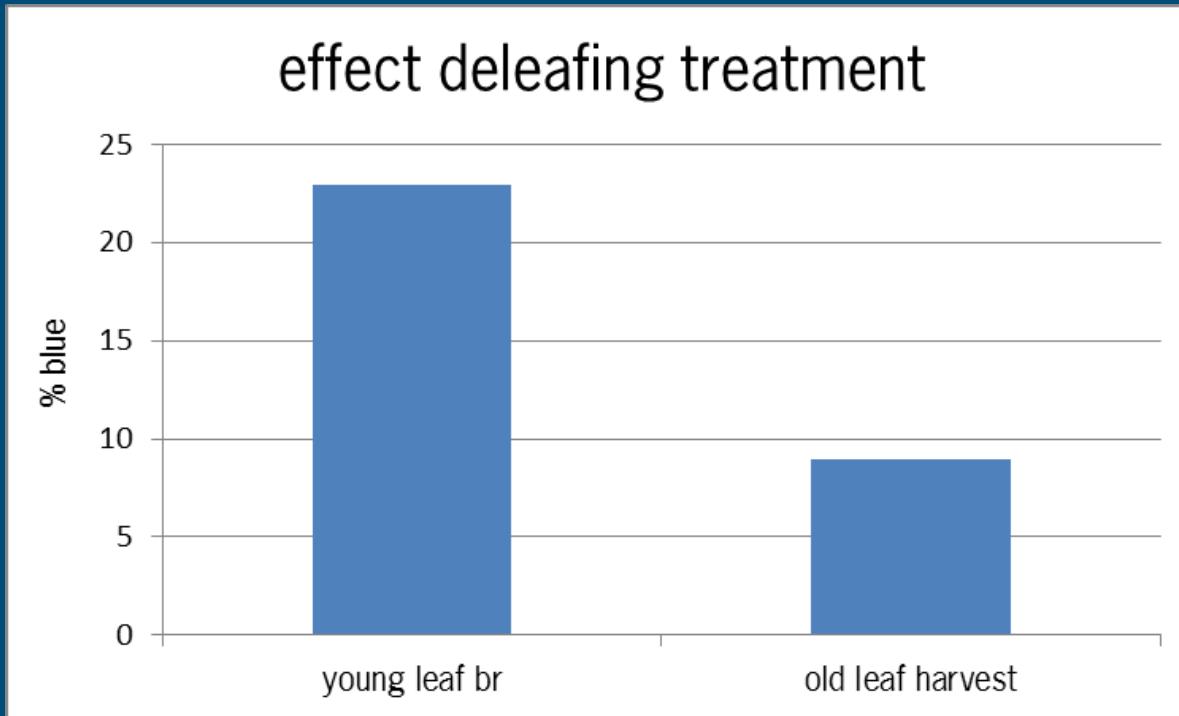
- Productive plants 'Tropical' were cultivated during 10 months in a 144 m<sup>2</sup> greenhouse, with 24 treatments susceptible to induce blueing
  - Influence blueing through the Calcium-supply
    - Low 0.5 mmol/l, std 1.6 mmol/l, high 2.5 mmol/l
    - Two EC levels (std 1.2, high 3.5)
    - Calcium as foliar fertilizer
  - Influence blueing by affecting the rootpressure
    - Increasing the RH (by covering with AC plastic)
    - Increasing the root temperature (heat 3°C > greenhouse T)
  - Influence of the pruning method
    - Tables with old leaf removal and with young leaf removal

# Trial set-up: tables wrapped with AC folie, root heating



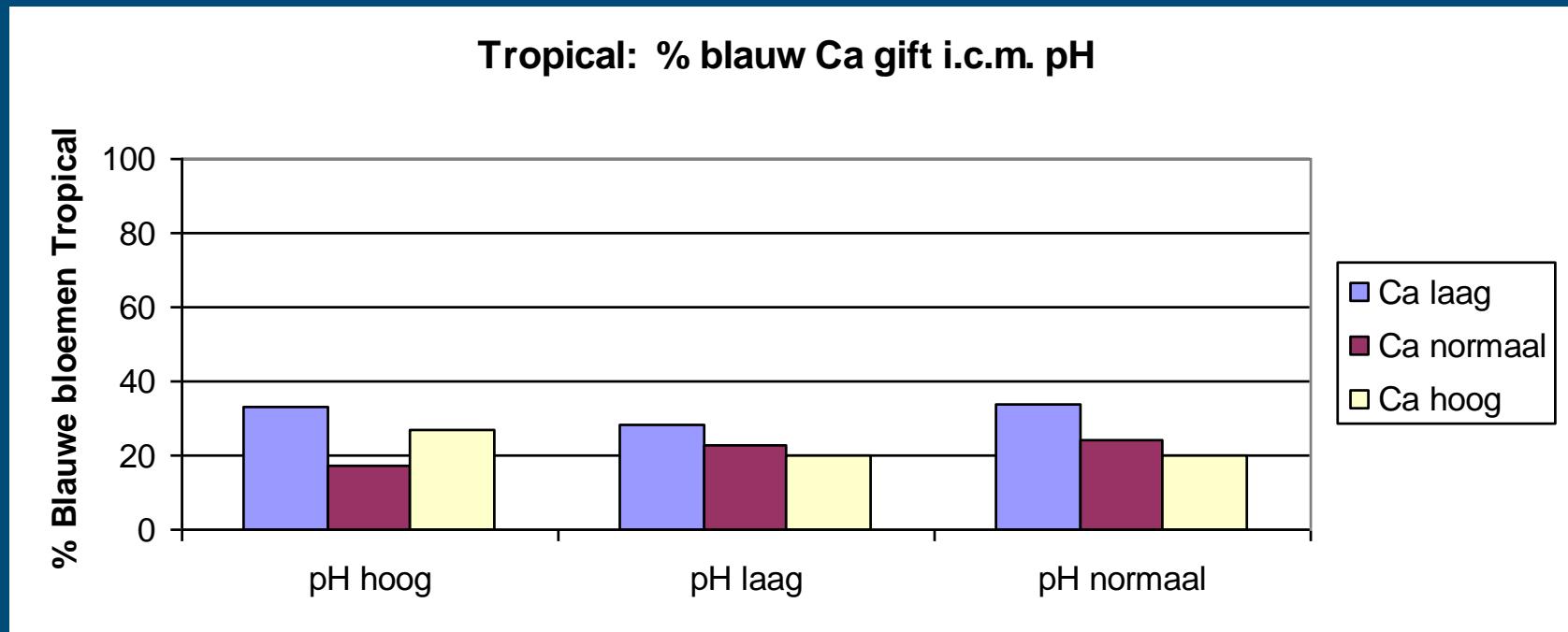
# Results greenhouse experiment:

- Effect pruning method on the blueing



# Results greenhouse experiment :

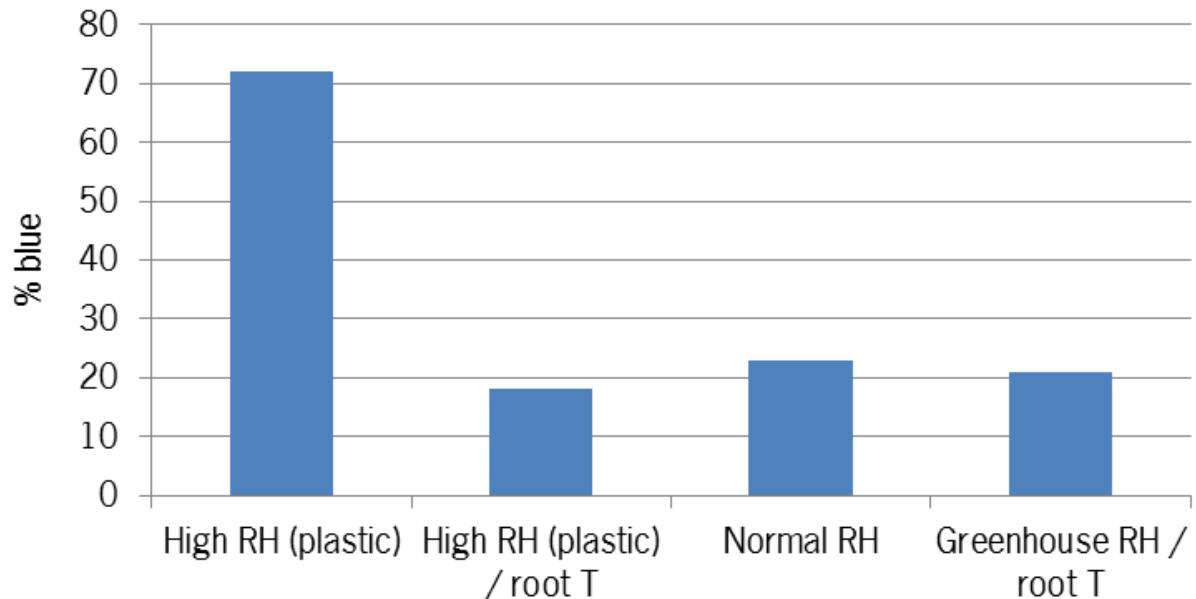
- Effect Calcium levels combined with pH levels



# Results greenhouse experiment:

## ■ Effect RH and root heating

effect RH / Root heating



# Conclusions greenhouse experiment

- In the cultivation conditions, it was impossible to totally avoid blueing.
- Removing the young leaves doubled the incidence of blueing compared to harvesting of old leaves.
- High RH (under AC foil) multiplied by 4 the blueing incidence; the blueing appeared before the harvest
- Heating the roots had very little influence on the blueing in the greenhouse environment, but inside the plastic cover it overcomed the effects of the high RH
- Increasing the Calcium supply does not result in a significant reduction of the blueing incidence compared to normal Calcium supply

# Thanks for your attention, questions?

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