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Effect of NIR-photoselective screen on production of greenhouse rose

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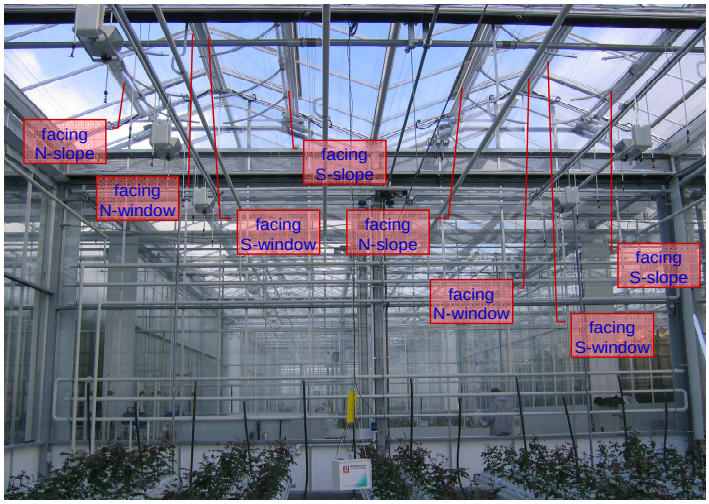
Introduction

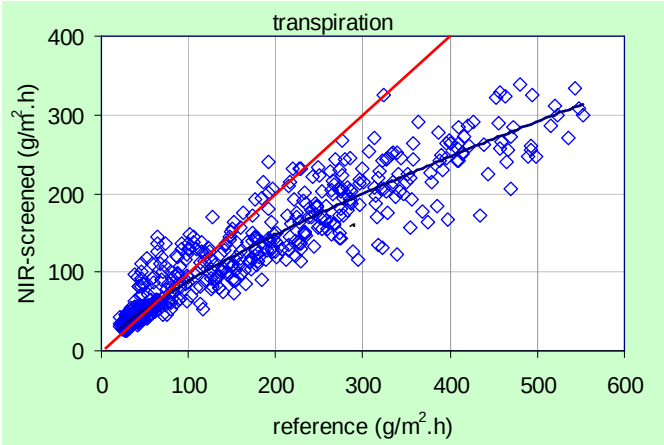
The ventilation that is required to control greenhouse temperature under high irradiation is not always welcome. Pest pressure increases, air can get too dry and a high CO_2 concentration cannot be maintained. Only about half of the solar radiation energy is used for crop photosynthesis (PAR). The Near Infra Red fraction (NIR) contributes to the heating of crop and greenhouse and to crop transpiration. A screen able to reflect the NIR part of the solar radiation would lower the ventilation requirement and crop transpiration without affecting assimilation. However, little is known yet about possible effects of the modified radiation environment on production and quality of roses.



Materials and Methods

The most selective film available was kindly provided by the producer, the 3M company. It reflects about 40% of the NIR energy. Our reference was a non-selective commercial screen with the same PAR transmissivity (about 85%). The movable screens were installed in four (2 NIR and 2 REF) compartments such as to be closed when the ventilation set-point was reached, yet not to limit ventilation, when necessary (see figure above). The climate control warranted equal air temperature and CO_2 concentration, in all compartments. The experiment with rose cv '*Passion*', lasted from May trough October 2008.

Results



The ventilation requirement was reduced by an estimated 10% and crop transpiration by slightly more. The relatively high natural reflectivity of crops in the NIR band limits the effectiveness of such filters. Yield dry matter was the same, in spite of 2% less harvested stems under NIR. Lower transpiration is the probable cause of the higher fresh weight of stems.

	REF	NIR
Fresh weight (g)	40.90±1.06b	44.36±1.14a
Stem length (cm)	73.10±0.60a	73.79±0.64a
Stem diameter (mm)	6.48±0.06a	6.49±0.06a
Bud height (cm)	3.747±0.027b	3.876±0.030a
Flower opening (cm)	4.98±0.09a	4.82±0.10a
Number of leaves	9.38±0.12a	9.33±0.15a

Conclusions

- Reduction of ventilation needs
- Higher water use efficiency
- No effects on crop development and production.
- Slightly higher stem quality
- Such a screen may make economic sense wherever scarcity of water limits application of evaporative cooling
- The photoselective properties of the screen could be better (NIR reflection ↑ & PAR transmission ↑)

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