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Efficient cooling of strawberries

From model calculation to implementation in a commercial greenhouse

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Problem

Starting a strawberry crop cycle in early August results in enough assimilates but a premature harvest with low production. Therefore growers postpone the start to the second half of August. This is a safe strategy, but it costs more energy. In a series of discussions with a group of strawberry experts, we calculated the effect of several alternative scenarios with the KASPRO simulation model and finally tested the solutions in a commercial greenhouse which was divided in four compartments.

Hypothesis

- Start early August to allow for bud development and the production of enough assimilates.
- Reduce the energy use by creating air movement with vertical fans.
- Reduce night temperature at the start of the crop cycle to spread the production and to increase fruit weight.
- Create a light- and temperature sum nearby “ideal”.

Four treatments in a commercial greenhouse

All compartments have misting and vertical fans (reference, section 1). Treatments include side wall vents (section 2), mechanical cooling (section 4) and mechanical cooling combined with floor insulation (section 3).

Photo 1: Misting

Photo 2: Cooler & floor insulation

Results

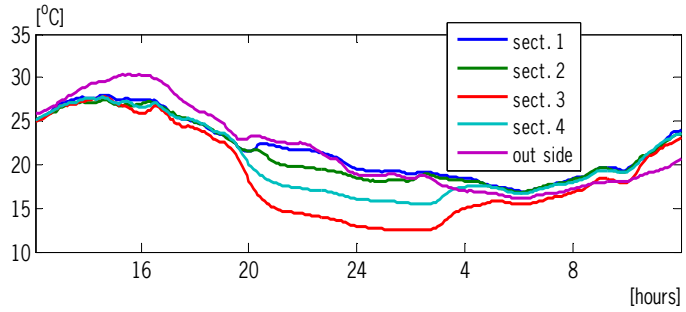

Figure1: Greenhouse air temperature, August 24 12:00 till 25th 12:00

The treatments created differences in the short term climate. At night, the sections 2 – 4 are in average 1.2, 6.7 and 3.7 °C colder then the reference.

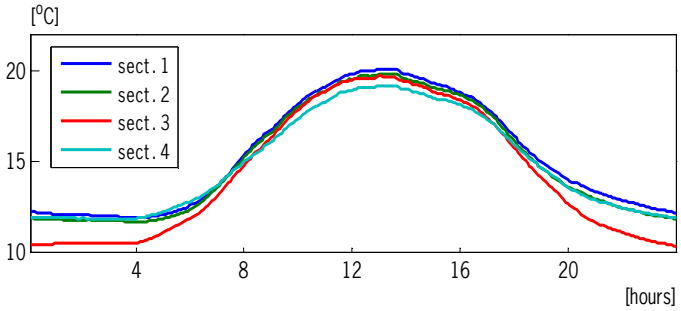

Figure2: Average twenty-four hours greenhouse air temperature course August – December

Insulation decreases night temperature by 1.5 °C

Conclusions

- Mechanical cooling with floor insulation significantly reduces the night temperature.
- The energy use dropped from around 20 m^3/m^2 (common practice) to about 14 m^3/m^2 by early start in august and the use of vertical fans.
- Over whole crop cycle (Augustus – May) no significant differences in crop growth, yield, quality and average fruit weight were found.
- We did not succeed in spreading the harvest.
- Possibly, the start of the crop cycle could have been earlier in sections with mechanical cooling.

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