

Effect of vertical temperature gradient on dry matter production, partitioning and fruit growth

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Introduction

- In semi-closed greenhouses, vertical temperature gradients along the canopy are induced when cooled air is blown into the greenhouse below the canopy
- Hypothesis 1: Vertical temperature gradient affects assimilate production and distribution because different plant parts experience different temperatures
- Hypothesis 2: Fruits at ripening stage experience lower temperature when vertical temperature gradient is present, resulting in bigger fruits due to longer growth duration

Materials and Methods

- Tomato cultivar Capricia (truss tomato)
- Each truss was pruned to maintain 6 fruits per truss
- 2 treatments in 4 greenhouses:
 - Vertical temperature gradient **absent**
 - Vertical temperature gradient **present**
- Data of July to September 2009 were analyzed



Figure 1. Blowing cool air into the greenhouse via horizontal ducts placed below the growing gutters (left picture), and blowing cool air into the top of the greenhouse via vertical ducts placed near the side walls (right picture).

Results

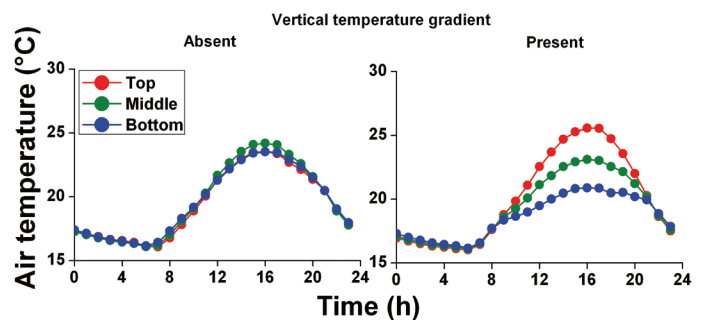


Figure 2. Diurnal air temperature at top (●), at middle (●), and bottom of the canopy (●) in the period of July to September. Top, middle, and bottom of the canopy are about 3.5 m, 1.8 m and 0.3 m above the growing substrate.

Table 1. Assimilate production and distribution during July – September 2009.

Vertical temperature gradient	Dry matter production (kg m ⁻²)	Dry matter partitioning to fruit (%)	Fruit dry matter content (%)	Harvested fruit number (fruit m ⁻²)	Fresh fruit weight (g fruit ⁻¹)
Absent	1.55	75.6	5.3	201	115
Present	1.58	78.2	5.5	196	124
P-value	n.s.	n.s.	n.s.	n.s.	0.016

P-value >0.05 was regarded as non-significant (n.s.).

Conclusion

- Vertical temperature gradient has no effect on dry matter production and partitioning to the fruits
- Vertical temperature gradient has a positive effect on individual fresh fruit weight