CULTURAL PRACTICES IN GREENHOUSE VEGETABLE CROPS

Climate control

- Objectives with respect to optimizing production efficiency:
- autumn/winter maximize the radiation quantity and minimize the energy loss;

• spring/summer – reduce high temperatures.

Heating in winter

- Lowering temperature slows down growth and development of most crops and may significantly reduce quality.
- Heat losses increase linearly as wind speed increases.
- Therefore, energy can be saved by reducing the heating setpoints when it is windy and compensating for this using increased temperatures at low wind speeds.

Temperature control

- An option for energy-efficient temperature control is the so-called temperature integration (TI) method.
- This method is based on the fact that the effect of temperature on crop growth and production depends on the 24-hour average temperature rather than distinct day/night temperatures.
- However, there are limits to this approach and plants have to be grown within the sub- and supra-optimal temperatures (e.g. tomato: > 15 °C and < 30 °C) to prevent reduced quality and/or production levels due to poor fruit or flower development

Impact of temperature difference between day and night on plant height and fruit set.

	Plantin	g at the	Planting at t	Planting at the end of		
DIF (°C)	beginning of March		Marc	March		
	Mean plant Number of		Mean plant	Number		
	height (cm) fruits per		height	of fruits		
		plant	(cm)	per plant		
5	75,5 a	3,1 b	102,1 a	9,1 b		
14	66,3 b	3,8 a	102,7 a	12,8 a		

Impact of cooling on the inside greenhouse temperature

	Air temperature		Leaf temperature		Fruit temperature	
	(°C)		(°C)		(°C)	
Month	July	August	July	August	July	August
Cooling	26,2	28,2	25,8	27,2	25,9	27,2
No cooling	29,4	30,4	28,6	29,7	28,3	30,3

Humidity control

- Under relatively low radiation and moderate ambient temperatures, natural or forced ventilation is generally used to prevent high humidity.
- Consequently a substantial fraction (5–20%) of the total energy consumption is related to humidity control.
- Although high humidity is generally associated with increased risk of fungal diseases and reduced quality (e.g. *Botrytis, blossom end rot), it may also be positive for crop production and* quality.

Humidity control in the warm season of the year



Impact of cooling on blossom-end rot





Thermal screens

 Energy-efficient (humidity) screen control can be achieved by opening the screen prior to the ventilators to maintain a given humidity setpoint.

Pruning and support

Pruning and support of tomato



Pruning and support of tomato







Two-stem tomato





Pruning and support of eggplant







Pruning and support of pepper



Pruning and support of cucumber

Umbrella System







Pruning and support of cucumber

Stem lowering



Pruning and support of melon





Removal of leaves

Fruit trimming

Support of pollination

Bumblebees

Irrigation

Fertilization