Steering and control of EC and WC in the slab under summer conditions

Grodan®

Part of the ROCKWOOL Group

Introduction

How does one optimise the slab EC and WC? As the longest day approaches, keeping the slab and the crop in the proper ‘rhythm’ is necessary for peak production and fruit quality under the most stressful and demanding period of the year.

The crop is now carrying a full fruit load and emphasis must be placed on fruit quality and helping the crop to survive through the summer and into the autumn.

Figure 1.0 provides a visualisation of how a structured irrigation strategy can help the crop through these ‘stressful times’. Start time of irrigation should occur ±200 W/m^2. Delaying the irrigation start time until this moment promotes the creation of an efficient (branched hairy) root system. Importantly 1st drain should be seen ±600 W/m^2, EC should be controlled during the peak solar period where irrigation supply should be matched to plant transpiration. As radiation levels fall again towards the end of the day the drain volumes can be reduced. An indicative value for irrigation stop time is when radiation falls below 300 W/m^2 allowing the plant to recover overnight.

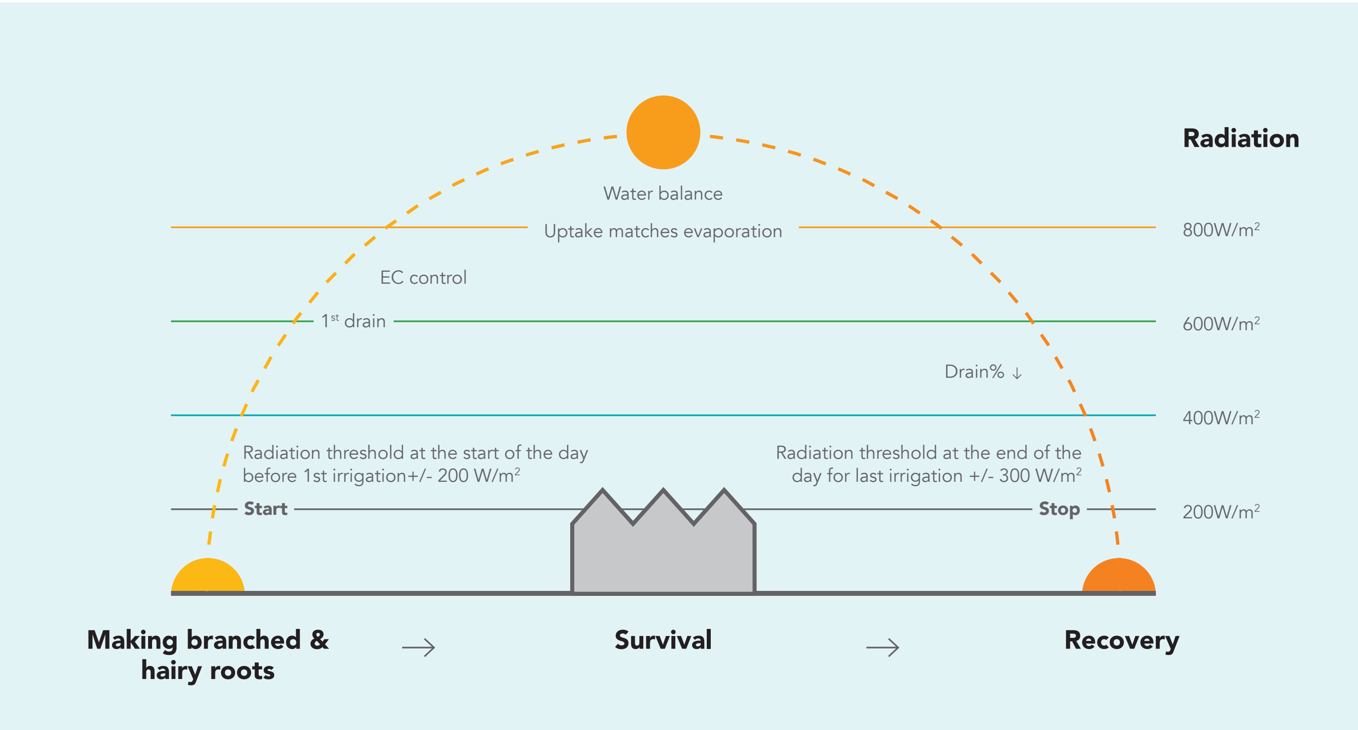


Figure 1.0
The thought process for structuring an irrigation strategy to promote stress free growing in summer.
Crop stress comes radiation intensities >600 W/m^2

Through the use of your GroSens system, the pattern of EC development can speak volumes about the status of the crop (Figure 2.0). If the fluctuation in EC over the course of a 24-hour period is 0.3 - 0.8 mS/cm^2 or less, there is nothing to be concerned about - this is normal.
If the fluctuation is less than 0.3 mS/cm^2 over the same 24-hour time period, it means that the volume per irrigation or the overall amount of irrigation given during the previous 24-hour period may be too large.
If the 24-hour EC fluctuation is approximately 1.0 mS/cm^2 or greater, it could be an indication that the overall volume of irrigation water per day is too small to meet the demand of the plants, the volume per irrigation session is too small or the time at which the irrigation’s are applied is incorrect.

When looking at graphics like that depicted in Figure 2.0 you can ask yourself a few very simple questions to determine if ‘all is well’ in the root zone and that the crop is growing stress free;

- What was the radiation intensity at irrigation start time?
- What was the radiation intensity at the moment of drain?
- Is EC lowest when radiation highest?
- How much radiation remains from last irrigation to sunset?
- Is the decrease in WC% stable between days?

Answers to these questions will focus the mind should changes be required.

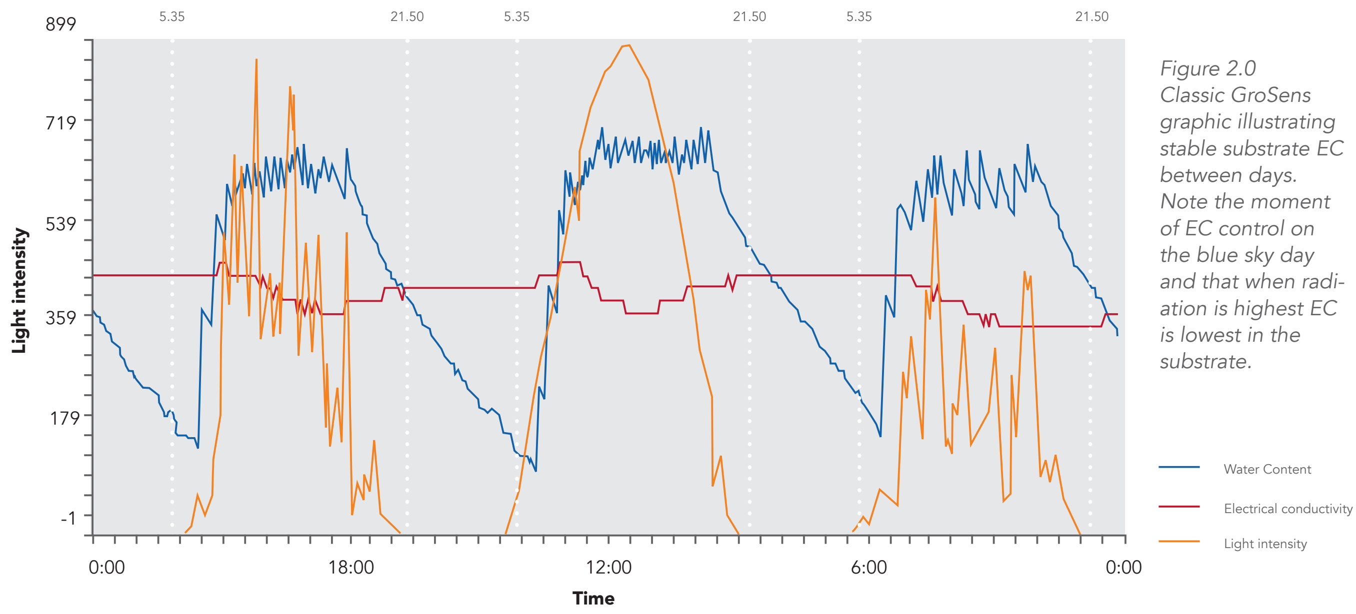


Figure 2.0
Classic GroSens graphic illustrating stable substrate EC between days. Note the moment of EC control on the blue sky day and that when radiation is highest EC is lowest in the substrate.

Indicative root zone EC targets relative to outside radiation are shown in table 1. The message here is simple, the acceptance of higher EC values at lower levels of radiation intensity. But what if the slab EC is deemed "too high" in summer? A rising EC may be an indication of crop stagnation. This is often associated with a crop that is overly generative and/or carrying too many fruit - in other words it is out of balance.

However there could be other reasons for a raising slab EC in summer and a crop that is out of balance. The most common issue is that the irrigation capacity (l/m²) of the total system is too low. Irrigation capacity is a function of dripper capacity and the number of irrigation zones in a start program (Table 2.0).

In an ideal world the irrigation capacity of the total system should be sized to deliver 1.2 to 1.5 l/m²/hr. You can see from Table 3.0 how the number of irrigation valves in a start program influences the maximum time each valve can be irrigated and its subsequent effect on irrigation capacity.

W/m²	EC in mS/cm tomato	EC in mS/cm cucumber	EC in mS/cm paprika	EC in mS/cm eggplant
200	8	5	6	6
400	6	4	5	5
600	5	3.5	4	4
800	4	3.2	3.5	3.5
1000	3.8	3.0	3.0	3.0

Table 1.0
Indicative root zone EC targets relative to outside radiation. Optimum EC will be dependent on crop type and variety. Contact your local Grodan advisor for more information.

	Example A	Example B
Number of irrigation zones	3	6
Maximum irrigation minutes / valve / hr	20	10
Dripper capacity ml/min*	55	55
Number drippers /m²**	1.1	1.1
Irrigation capacity (l/m²/hr)	1.21	0.60

Table 2.0
**Indicative of 3 l/hr dripper.*
***Typical of a grafted tomato plant with 2 heads per block initial plant density 2.2 plants /m²*

	Example A	Example B
Outside light intensity (W/m^2)	900	900
Equivalent J/cm^2	324	324
Crop transpiration (ml/J)	3.0	3.0
Required irrigation supply ($l/m^2/hr$)	0.97	0.97
Max supply available	1.21	0.60

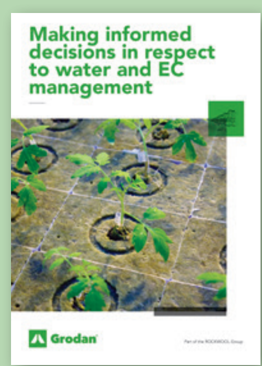
Table 3.0
Effect of irrigation capacity on water availability to the crop.
Assumes constant light intensity for 1 hour.

For identical conditions you see that in Example B the irrigation capacity is too low to match what is required by the crop. Agreed it's an extreme example, but it occurs. However extreme the under capacity is the result is the same; a decreasing substrate WC% and increasing EC in the afternoon. The most common 'remedy' in practice is that compensations are made to the start and stop times and the irrigation day is 'extended' to try to maintain the substrate WC% at a certain level. As a dual action the dripping EC is also lowered (sometimes too far) to compensate for the rising EC day-after-day. However this is short sightedness. In practice in the middle of the day in Example B the steering computer is on 'wait' as the valves sequence their cycles. Consequently in the middle of the day when uptake should match transpiration to ensure the crop is stress free (Figure 1.0), EC rises uncontrollably in the substrate. The crop becomes stressed, fruit quality and production is lost.

More whitepapers

Monitoring nutrient balance, pH & EC in the root zone

The composition of the nutrient solution should be appropriate to the needs of the crop. One of the benefits of using Grodan stone wool substrates is that the nutrient composition is under total control of growers.



Making Informed decisions in respect to water and EC management

How to fine tune the irrigation strategy during spring & summer to avoid costly mistakes using tools such as the Grodan GroSens system and the graphics function of the climate computer.

Download them here www.grodan.com/learning/ec

Grodan supplies innovative, sustainable mineral wool substrate applications for professional horticulture, based on the Precision Growing principle. These applications are used for the growing of vegetables and flowers, such as tomatoes, cucumbers, capsicums, aubergines, roses and gerberas. Grodan supplies stone wool substrates in combination with customized advice and innovative tools to support growers with Precision Growing. This facilitates sustainable production of healthy, safe and delicious fresh produce for consumers.

Rockwool BV / Grodan
Industrieweg 15
P.O. Box 1160, 6040 KD Roermond
The Netherlands

t +31 (0)475 35 30 20
f +31 (0)475 35 37 16
e info@grodan.com
i www.grodan.com
in www.linkedin.com/company/grodan
www.twitter.com/grodan
@grodaninternational

Grodan is the only supplier of stone wool substrates with the EU-Eco label.

EU Ecolabel: NL/048/001