

Growth inhibition caused by reused drainage water; quest for cause and measuring method

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Background

Growth inhibition is a reason for growers to refresh the recirculation water and to discharge the excess water. The cause of growth inhibition is still an issue.

Objective

Determination of the cause of growth inhibition and the development of methods to determine growth inhibition in an early stage in the crop in situ.

Methods

- Search on growth inhibitory components in drain water of a rose cultivation by means of stepped analysis in the crop, the substrate en in water.
- Monitoring of the course of the oxygen concentration in the root environment
- Measurement of the efficiency of photosynthetic light utilization on plant leaves.

Results

Laboratory analyses

Drainwater from rose cultivation with light growth inhibition:

- Heating, ozone treatment and UVC-disinfection eliminates growth inhibition
- Water that passed through a 0.2 micron filter, gives an improvement in bioassay. That does not apply to the filtrate which has passed through a 0.45 microns filter. Inhibition of growth is very likely caused by one or different species of bacteria.
- Mixture of plant protection products (PPP's) at different concentrations showed no growth inhibition in Fytotoxtest and in cucumber bio-assay.

Table 1. Results bio-assay with an ascending series of plant protection products .

PPP's from rose cultivation	Reference	Conc. 100x	Conc. 10x	Conc. 1x
15 active ingredients				
Fytotoxtest:				
root length cress	100%	110%	115%	113%

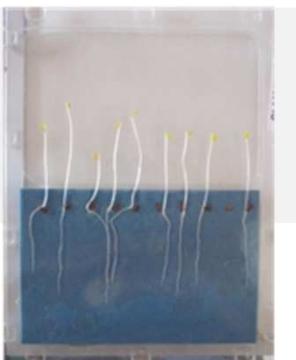


Figure 1. Fytotoxkit



Figure 2. Measurement setup with optical oxygen sensors

Oxygen measurements

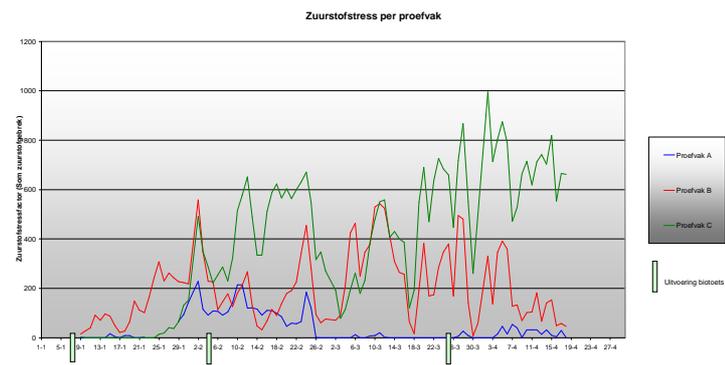


Figure 3. Calculated oxygen stress in three test sections A, B and C.

Several times oxygen stress in the substrate slab measured. No clear relationship with the crop growth demonstrated.

Photosynthetic light utilization

Light use efficiency rose crop (11-03-2011)

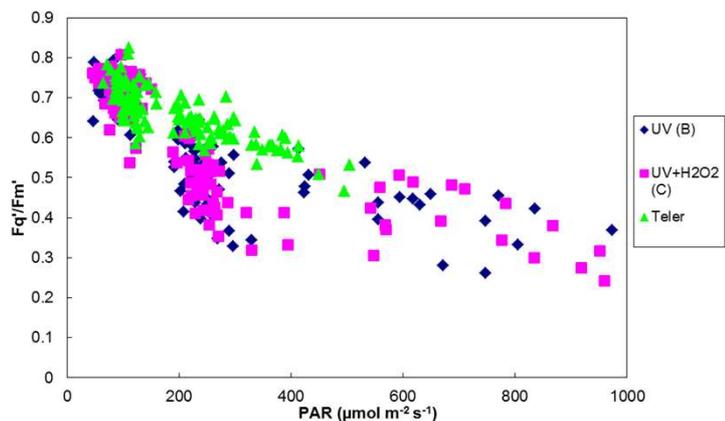


Figure 4. Measured light resource utilization efficiency on plant leaves in three test sections.

At one time of measurement differences in light utilization efficiency were found between the treatments.

Conclusions

- Growth inhibition in the drainage water was mainly caused by a microbiological factor, most likely of bacterial origin.
- No clear relationship has been demonstrated between growth inhibition and oxygen stress.
- It is not shown that light measurements are a good indicator for an early detection of growth inhibition.