WAGENINGEN UNIVERSITY
WAGENINGEN UR

Algal biosensors for monitoring drain water in greenhouses

R.M.C. Jansen[1], T.H. Gieling, R. van der Schoor, H. Jalink

Introduction

In future, penalties will be imposed on greenhouse growers if they bring polluted water into the environment. As a consequence, growers would like to know whether their drain water contain any pesticide residues. Therefore, continuous detection and on-site monitoring of drain water are of great demand in greenhouse management. This could be achieved with current methods based on spectrometric electrochemical techniques such as gas chromatography – mass spectrometry. However, those techniques are costly, time-consuming and they are facing long delays after sampling to produce expected results. Therefore we propose the use of biological sensors permanently settled in the greenhouse. In the proposed study, algal cells are chosen for their expected sensitivity towards pesticides.

Methods and materials

The work so far concerned the combination of an LED induced fluorescence transient imager and a filamentous algae (*Pithophora*). The imager consisted of four major components: array of LEDs, CCD camera, LED power supply and a computer (Jalink and Van der Schoor, 2011). The algal biosensor (Fig. 1) was treated with the herbicide Sencor (70% metribuzin a.i.). Per petri dish, multiple droplets of 2 µl were applied.

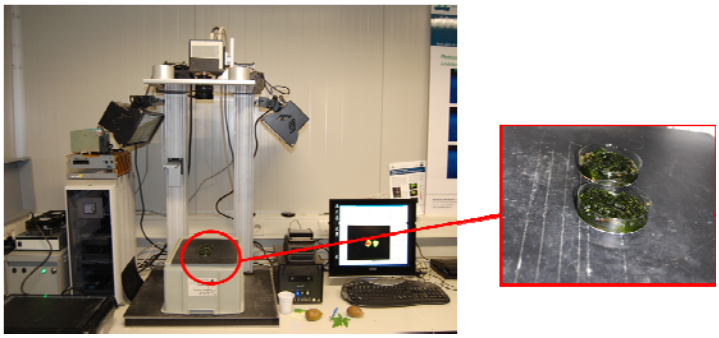

Fig. 1. Biosensor based on LED induced fluorescence transient imager

Results

The images of the activity of photosynthesis showed clearly the spots that were treated with the herbicide (Fig. 2). The treated spots showed a decrease (red color) in activity of photosynthesis compared with the rest of the petri dish. This was due to the inhibition of photosynthesis by the pesticide yielding a lowering in the activity of photosynthesis.

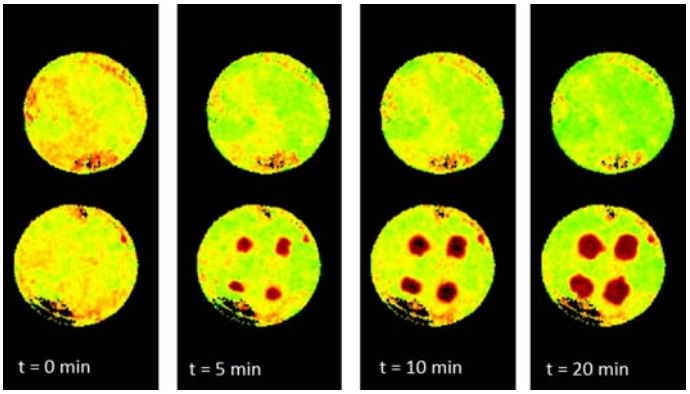

Fig. 2. Images of the activity of photosynthesis of control algae (top) and algae after application of Sencor (bottom). Results are obtained at 0, 5, 10, and 20 min after application.

Discussion and conclusion

These results suggests that chlorophyll fluorescence kinetics in algae can be used to monitor drain water in greenhouses for the presence of herbicides. Future work should focus on the construction of a robust, reliable and low-cost whole-cell biosensor based on chlorophyll fluorescence. In addition, pesticides (insecticides, fungicides), and other algae species should be studied to establish dose - response relations.

Jalink, H.; Schoor, R. van der (2011) Led induced chlorophyll fluorescence transient imager for measurements of health and stress status of whole plantsIn: Proceedings of the International Symposium on High Technology

[1]Wageningen UR Greenhouse Horticulture
P.O. Box 644, 6700 AP Wageningen
The Netherlands
www.greenhousehorticulture.wur.nl
Roel.Jansen@wur.nl