

## **A METHOD TO DETECT PLANT-DAMAGE-INDUCED VOLATILES IN A GREENHOUSE**

**Roel Jansen<sup>1</sup>, Jan Willem Hofstee<sup>1</sup>, Francel Verstappen<sup>2</sup>, Harro Bouwmeester<sup>2</sup>, Maarten Posthumus<sup>3</sup>, Eldert van Henten<sup>1-4</sup>**

<sup>1</sup>Wageningen University, Farm Technology Group, P.O. Box 17, 6700 AA, Wageningen, Wageningen, 6708 PD, The Netherlands [roel.jansen@wur.nl](mailto:roel.jansen@wur.nl)

<sup>2</sup>Plant Research International, P.O. Box 14, 6700 AA, Wageningen, The Netherlands [harro.bouwmeester@wur.nl](mailto:harro.bouwmeester@wur.nl)

<sup>3</sup>Wageningen University, Laboratory of Organic Chemistry, P.O. Box 8026, 6700 EG, Wageningen, The Netherlands [map.orc@wur.nl](mailto:map.orc@wur.nl)

<sup>4</sup>Wageningen UR Greenhouse Horticulture, P.O. Box 16, Wageningen, The Netherlands [eldert.vanhenten@wur.nl](mailto:eldert.vanhenten@wur.nl)

### **Keywords**

**Tomato, greenhouse, air sampling, gas chromatography/mass spectrometry system**

### **Abstract**

Early detection and location of plant damage due to pests and pathogens is a major challenge in commercial greenhouse cultivation. It allows the crop manager to perform site-specific actions instead of full field treatment. This will reduce the use of pesticides. Previous laboratory experiments have revealed that sensing volatiles released by the damaged plants might offer a powerful technique to monitor the status of greenhouse crops.

Such laboratory experiments that confirm the change of volatile substances released after damage are not new. However, the development and validation of a method to detect plant induced volatiles in a greenhouse was not practiced until now. The objective of this research was to ascertain if volatile plant substances released after artificial damage could be detected under greenhouse conditions. A method was developed to analyse the air in a semi-closed greenhouse with 44 m<sup>2</sup> floor area. This greenhouse, with a volume of 270 m<sup>3</sup>, was climate controlled and light was supplied with assimilation lamps. Sixty tomato plants (*Lycopersicon esculentum* Mill cv. Moneymaker) were grown in this greenhouse. These plants were artificially damaged on a weekly interval by touching the stems. Small, battery charged continuous flow pumps were used to purge the air surrounding the plants through tubes containing an adsorbent. This sampling step was performed before and directly after damage of

the plants. The air was sampled at three locations within the greenhouse to provide insight into the spatial distribution of volatile substances inside the greenhouse. After sampling, the tubes were transferred to the lab for analysis. The analysis of volatile compounds was performed using a high-throughput gas chromatography / mass spectrometry system. The proposed method enabled the detection of baseline level emission and the emission of volatiles released after artificial damage of the tomato plants during a three months growing period. Most dominant volatile compounds after damage were the monoterpenes  $\beta$ -phellandrene, limonene, 2-carene and the sesquiterpene  $\beta$ -caryophyllene. The compounds showed an increase of 100 times compared to baseline level emission. With these results, we prove that it is possible to detect plant damage induced volatiles in a greenhouse. This area of research is promising but more research needs to be done to determine whether it is possible to detect plant damage due to pests and pathogens using volatile sensing.