

High-throughput headspace sampling chamber

<https://search.researchequipment.wur.nl/SearchDetail.aspx?deviceid=ba381244-a3a2-49ef-b9ec-9bff4330550c>

Brand

Type

Contact

Francel Verstappen (francel.verstappen@wur.nl)

Organisation

Plant Sciences Group

Department

Laboratory of Plant Physiology

Description

The high-throughput headspace sampling facility consists of two growth cabinets equipped with climate and light control, that can be regulated separately, containing 6 trapping cuvettes each. The LED-light sources can be adjusted for the light intensity and period as well as for the light spectrum. This High-throughput headspace trapping chamber is part of the headspace facility. The other part of this facility is the Thermo desorption GCxGC-QTOF-MS.

Principle

The LED-light sources can be adjusted for the light intensity and period as well as for the light spectrum. Because the cuvettes are modular their size can be adapted to the sample size. Cuvettes are operated using push-pull sampling. Hereto, clean air is pumped into each cuvette and volatiles will be sampled through a cartridge containing an adsorbent such as Tenax at a lower flow rate. This will result in a slight over-pressure in the chambers such that no outside air will leak in. Because these flows are controlled precisely, in each of the twelve cuvettes trapping occurs quantitatively and comparable. A separate space with similar light and temperature conditions in front of the growth cabinets is available for adaptation of plants. Automated Tenax trap switching will enable headspace analysis over time (induction patterns, D/N changes, light and temperature effects).

- headspace trapping part of the facility, consisting of two growth cabinets (a) equipped with light and climate control (b) each containing 6 custom-made modular glass cuvettes (c) through which the flow is controlled by two 12-channel flow control units (d). Cuvettes will be operated using push-pull sampling. That is, clean air (generated using a zero-air generator, e) will be pumped into the chamber at X L/h (depending on the size of the chamber) and volatiles will be sampled through a cartridge (f) containing an adsorbent such as Tenax at 0.5 L/h.

- The analytical part of the facility consists of the unit g, consisting of a Markes thermal desorber TDU that can hold up to 100 cartridges (liners) containing Tenax or other adsorbents installed on an Agilent 7890 gas chromatograph (h) coupled to an Agilent QTOF Mass Spectrometer (i). The GC is equipped with a Zoex GCxGC module (j) that allows separation of complex volatile mixtures on two different GC-columns for ultra-high separation power.

Technical Details

- Two growth cabinets with each 6 modular cuvettes.
- Modular glass cuvettes from 0.5 L, 1 L, 2.5 L and possible to 1.0 meter in height and 30 cm diameter
- Different LED lighting: white, deep red, far red and blue; can be adjusted individually (light period, intensity and quality).
- In- and outlet flows both regulated by precise mass flow controllers (range from 10 to 600 mL/min).
- Clean inlet air is generated using a zero-air generator and subsequently adjusted for relative water content and CO₂ concentration.

Applications

To collect volatiles as indicators of an organism's condition under different environments.

