

# A WITHIN-CHAMBER CUTTING METHOD FOR REAL-TIME QUANTIFICATION OF LEAF WOUNDING VOLATILES AND GAS EXCHANGE

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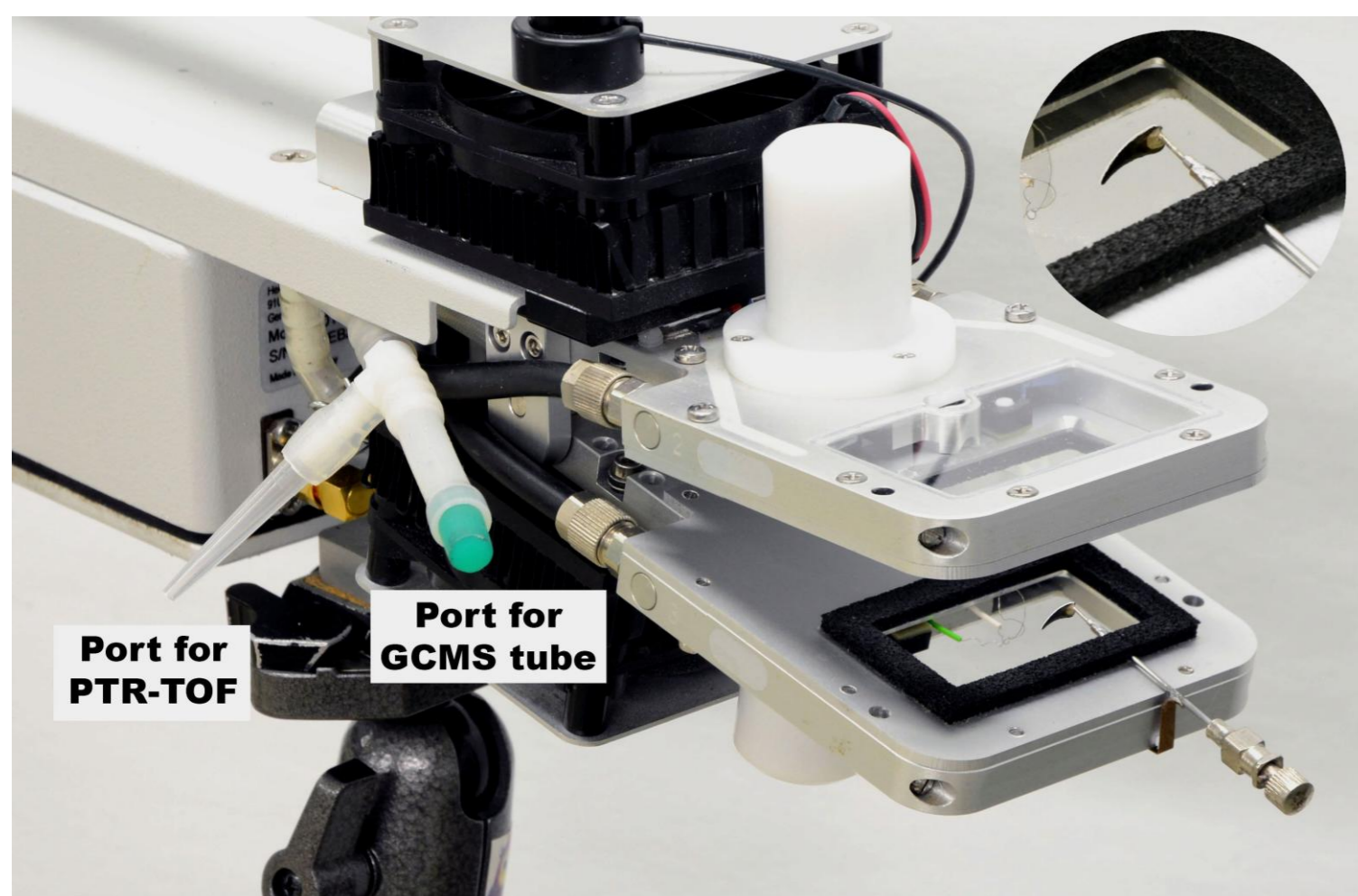
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## Introduction

Although tissue damage triggers rapid volatile emissions that shape plant stress signalling and atmosphere interactions, conventional VOC approaches fail to resolve these early kinetics in real time due to delays and sampling artifacts that distort the initial dynamics<sup>1</sup>.

To address this challenge, this work introduces a standardized, **within-chamber leaf-cutting protocol** optimized for **real-time monitoring of gas exchange** and **wound-induced VOCs** in both attached and detached leaves.



**Figure 2.** Modified Walz GFS-3000 gas-exchange system with an integrated within-chamber leaf cutter along with ports for PTR-TOF-MS and GC-MS sampling.



**Figure 1.** Geometridae larva feeding on *Quercus robur*.

## Method

We integrated a surgical-grade cutter to simulate herbivory (Figure 1) into a Walz GFS-3000 chamber coupled to a PTR-TOF-MS (Figure 2) to synchronize leaf wounding with VOC detection under stable gas-exchange conditions, to test the system across three species (*Quercus rubra*, *Acer platanoides* and *Gossypium hirsutum*) to evaluate the temporal resolution of wound-induced VOC dynamics (Figure 3).

## Results

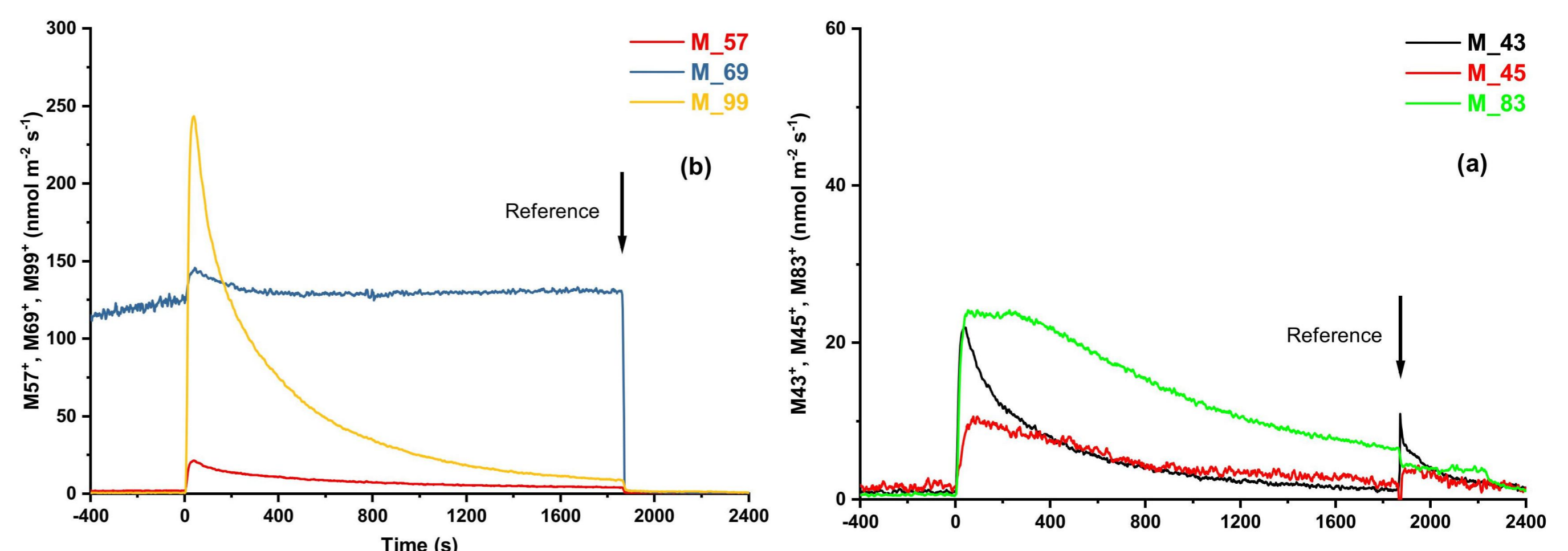
Leaf cutting triggered compound-specific VOC emissions within seconds across all species. The within-chamber system resolved emission onset, peak timing, and burst progression without interruption artifacts. Mass 99+ dominated the acute response phase (39–57 s). Masses 43+, 57+, and 69+ defined the early burst phase, whereas masses 45+ and 83+ peaked later (Figure 4). The synchronized setup resolved wound-induced kinetics beyond the temporal limits of conventional approaches.

## Conclusion

By synchronizing leaf wounding and detection within a stable gas-exchange environment, the within-chamber protocol overcomes conventional VOC measurement limitations, directly capturing rapid wound-induced volatile dynamics while providing a framework for plant stress and plant-atmosphere research.



**Figure 3.** *Quercus rubra* leaf in a Walz GFS-3000 chamber configured for simultaneous PTR-TOF-MS real-time tracking and synchronous GC-MS data sampling.



**Figure 4.** Time-resolved wound-induced VOC emissions in a representative leaf of *Quercus rubra*. (A) m/z 43, 45, and 83. (B) m/z 57, 69, and 99.