NEWSLETTER

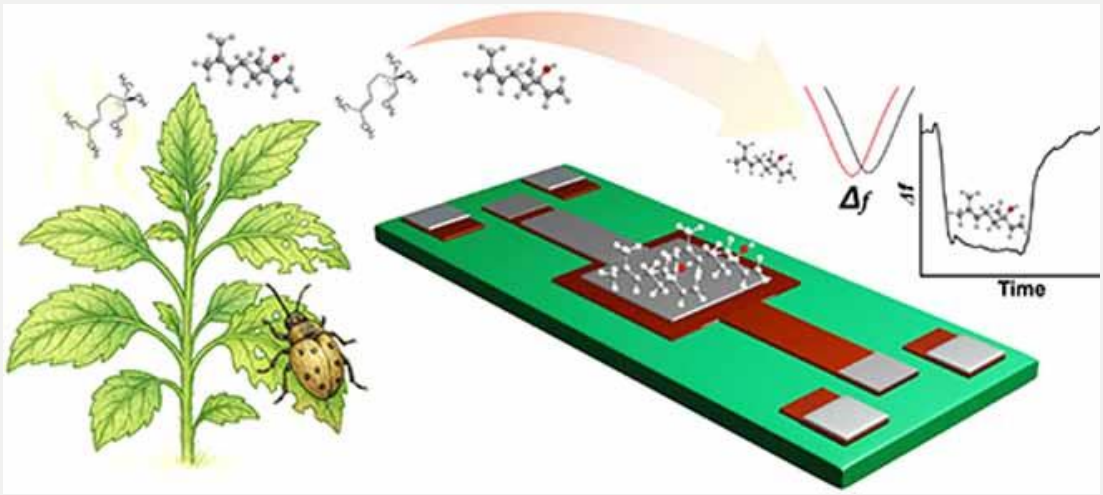
January 2026

THE PURPEST PROJECT

NEWS

PurPest summer activities:

- PurPest VOC Measurement Campaigns
- Latest Purpest Publications
- Patent Acceptance
- Recent highlights



Yaqoob, *et al.*, 2025

Welcome to the first PurPest newsletter of 2026!!!

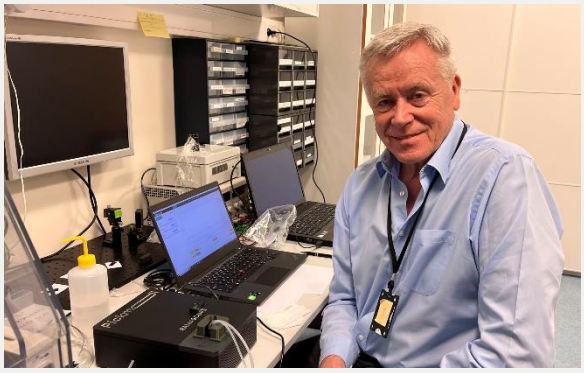
As PurPest enters its final year, we celebrate the journey from laboratory innovation to field-ready solutions for early pest detection. Over the past years, our campaigns across Europe and beyond have refined sensor technologies, captured pest-specific VOCs, and integrated AI-driven analysis, bringing us closer than ever to safeguarding crops, forests, and ecosystems. This year, we will focus on full deployment, pilot demonstrations, and turning our hard-earned insights into practical, real-world impact.

Co-funded by the European Union

PurPest VOC Measurement Campaigns: From Lab to Field

The PurPest project has been on a mission: to detect plant pests early and reliably by monitoring volatile organic compounds (VOCs) emitted by the pests and stressed or infested plants. This mission has been brought to life through a series of strategically planned campaigns, combining cutting-edge sensor technology, AI-driven analysis, and real-world plant testing.

The journey began in May 2023, when PurPest team members visited the Julius Kühn Institute (JKI), for a workshop, where all were welcomed by **Jürgen Gross and his team**. The workshop focused on volatile collection using the **Fragrance Collection Device (Flusys)**, providing critical hands-on experience and strengthening collaboration with key technology partners



In March 2024, **Pavol Miškovský** from Saftra Photonics visited SINTEF, to test the **Ramascope for VOC detection**, sparking the first step toward field-ready sensor evaluation and strengthening collaboration with technology partners.

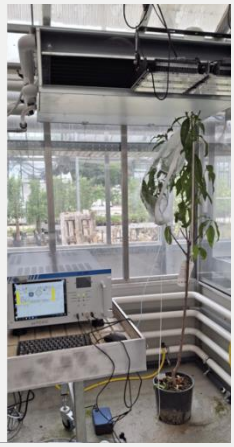
Shortly after, **Ted Turlings** from the University of Neuchâtel (UNINE) conducted a field campaign in Mexico, collecting VOCs from maize plants infested with fall armyworm (*Spodoptera frugiperda*) and healthy controls. This work evaluated the feasibility of capturing pest-induced volatiles under natural conditions and provided critical insights for developing robust, field-ready detection technologies.

In April 2024, PurPest partners gathered at AIRMOTEC/Chromatotec, for an intercomparison campaign. **Sensors from SINTEF, Saftra Photonics, University of Warwick, and Volatile were tested** against VOC tracers from *Phytophthora ramorum*, cotton bollworm, and brown marmorated stink bug, with GC-FID-MS as a reference.

The campaign validated sensor performance, promoted collaboration, and advanced the development of reliable detection solutions.

PurPest VOC Measurement Campaigns: From Lab to Field

Between 10–26 March 2025, AIRMOTEC conducted extensive tests of the Sensor System Prototype (SSP) at UNINE, comparing standard PID sensors with a new heated PID and microfluidic system.



By August 2025, the SSP reached the University of Padua, where VOC collectors measured emissions from peach, pear, apple, and soybean plants under stinkbug infestation, demonstrating the sensors' readiness for practical agricultural use.

October 2025 marked the second measurement campaign at UNINE, where improved SSP prototypes monitored healthy and fall armyworm-infested maize under semi-natural conditions. Using SSP, GC-PID, and PTR-TOF-MS systems, researchers refined VOC fingerprints and validated detection accuracy.

In November 2025, collaboration with VolatileAI introduced AI-driven VOC fingerprinting, enabling recognition of pest-specific chemical patterns with unprecedented precision.

These campaigns are more than experiments—they are the lifeblood of PurPest's mission. Every VOC measured, prototype tested, and AI model trained brings inspectors, growers, and forest managers closer to safeguarding crops, forests, and ecosystems across Europe. PurPest is not just measuring VOCs—it is shaping the future of pest detection, one molecule at a time.

Looking Ahead: Final Year of PurPest

As PurPest enters its final year, the focus will shift to full deployment and demonstration of field-ready solutions. Teams will integrate lessons from previous campaigns, optimize sensor prototypes, and expand AI analysis to cover more pests and crop systems. Pilot studies across Europe will showcase rapid, reliable VOC-based pest detection, empowering inspectors, growers, and forest managers with actionable insights and bringing PurPest closer than ever to transforming early pest detection into a proactive, real-world solution.

Latest Publications

Alongside PurPest's field campaigns and technological development, several scientific publications were released on VOC-based early pest detection and advanced sensor technologies.

Rapid and Selective Detection of Linalool Using Solidly Mounted Resonators for Plant Health Monitoring

Usman Yaqoob, Barbara Urasinska-Wojcik, Siavash Esfahani, Marina Cole, Julian W. Gardner, *Fellow, IEEE*

This article presents a novel sensing approach based on **solidly mounted resonators (SMRs)** functionalized with ethyl cellulose for the selective detection of **linalool**, a volatile organic compound commonly associated with plant stress, herbivory, and pest infestation. The study demonstrates high sensitivity, selectivity, and low power consumption, highlighting the suitability of SMR-based sensors for **real-time, non-invasive VOC monitoring**. The work is particularly relevant to PurPest, as it showcases a compact and robust sensor technology that could complement VOC-based detection platforms designed for early pest identification in field conditions.

https://doi.org/10.1109/JSEN.2025.3626138

Environmental impacts of agricultural pest insects: five case studies reveal overlooked impact mechanisms and specify knowledge gaps

Kiran Jonathan Horrocks, Jörg Romeis, Jana Collatz

This work examines the broader **environmental impacts of major agricultural pest** insects through five detailed case studies, revealing previously overlooked impact mechanisms and identifying important gaps in current knowledge. Beyond direct crop damage, the study highlights effects on ecosystem functioning, biodiversity, and agricultural sustainability. These insights provide essential ecological context for PurPest by improving understanding of pest–plant–environment interactions, thereby **supporting better interpretation of VOC signals, more informed sensor deployment, and more effective pest monitoring strategies** across diverse agricultural systems.

https://doi.org/10.3897/neobiota.104.158217

Modeling disease expression of *Phytophthora ramorum* to estimate potential economic impacts in European forests

Stelios Kartalis, Thomas Jung, Darren J. Kriticos, Justus Wesseler

This study introduces an integrated modelling framework that combines **disease spread dynamics with economic impact assessment** to evaluate the potential consequences of *Phytophthora ramorum* outbreaks in European forests. By linking ecological processes with forest management costs and economic losses, the research demonstrates how early detection and timely intervention can significantly reduce both environmental damage and financial impacts. The findings strongly support the rationale behind PurPest's early detection approach, highlighting how **VOC-based monitoring could play a critical role in proactive forest biosecurity and risk mitigation strategies.**

https://doi.org/10.1016/j.foreco.2025.123367

Patent Acceptance: Advancing SERS-Based Detection Technology

PATENTOVÁ LISTINA

Úrad priemyselného vlastníctva Slovenskej republiky udelil podľa § 44 ods. 4 zákona č. 435/2001 Z. z. o patentoch, dodatkových ochranných osvedčeniach a o zmene a doplnení niektorých zákonov v znení neskorších predpisov patent

číslo 289367

In December, **Saftra Photonics** achieved a key milestone with Slovak Patent SK 289367 B6, enhancing Surface-Enhanced Raman Spectroscopy (SERS) for the PurPest project. The patented device ensures precise, reproducible sample positioning in portable Raman spectrometers via piezoelectric actuators, maintaining compactness for field use. This innovation tackles a major SERS challenge—measurement stability and reproducibility—enabling reliable detection of trace volatile organic compounds (VOCs) in the ppm–ppb range. Within PurPest, it supports portable, high-sensitivity sensing tools, bridging lab-grade techniques and real-world pest detection, and underlines how hardware innovation accelerates rapid, non-invasive agricultural and forestry monitoring.

Recent highlights

The final months of 2025 marked an intense and highly visible period for PurPest, with the project reaching scientific communities, policymakers, practitioners, and the wider public through a diverse set of dissemination activities across Europe and beyond.

Scientific Excellence & Knowledge Exchange

PurPest maintained a strong presence at major scientific events throughout October.

From 7–10 October 2025, the project was represented at the German Congress of Plant Protection in Braunschweig, one of Europe's leading forums for plant protection research.

Shortly after, from 13–17 October, **Stelios Kartakis** visited Queen's University Belfast for a focused research stay on discrete choice modelling, analysing PurPest nursery survey data with **Dr Insa Thiermann** to better understand how VOC sensor technologies may be adopted by European nurseries.

On 17 October, **Luís Bonifácio** (INIAV) delivered a keynote lecture at the EABRACE Workshop, highlighting the ecological relevance of quarantine pest detection in forestry and agriculture.

Later that month, on 30 October, PurPest reached a global scientific audience at the International Pest Risk Research Group (IPRRG) Annual Meeting in Kuala Lumpur, where **Stelios Kartakis** presented the project's latest results on pest risk and impact assessment.

From Research to Real-World Practice

In November, PurPest strengthened its engagement with key end users and decision-makers.

On 20 November 2025, **Luís Bonifácio** (INIAV) presented the project at the VIII National Meeting of Portuguese Forest Health Inspectors, organized by ICNF. The presentation generated strong interest among inspectors, confirming the practical relevance of VOC-based detection tools for phytosanitary control and forest biosecurity.

Scientific dissemination continued in December with a poster presentation at Microbiotec 2025 (Azores) by **Jorge Faria and Gonçalo Pereira**, exploring VOC emissions from Pinus pinaster genotypes with different susceptibility to pine wilt disease—further linking VOC research to forest health applications.

Policy Impact & International Visibility

PurPest also reached high-level policy audiences.

On 4 November 2025, **Andrea Ficke** presented the project at the WTO SPS Committee Thematic Session on science-based import controls, highlighting how VOC-based detection can support safe international trade. This impact was amplified by the release of the video "PurPest at the WTO – Science for Safe Trade!", extending the project's visibility well beyond the meeting itself.

Engaging the Public

Beyond scientific and policy circles, PurPest continued to engage broader audiences.

On 31 October, **Andrea Ficke** featured in the podcast "Sniffing out plant pests", explaining how electronic noses can detect hidden pests before visible damage occurs.

In December, the project released a new educational video, "PurPest – The Cotton Bollworm", introducing one of the key pest species studied and showcasing how VOC-based sensing can support early detection and sustainable pest management.

Technology Showcases & Innovation

Innovation remained at the heart of PurPest's outreach.

In early December, **Prof. Pavol Miškovský** and the Saftra Photonics team showcased SERS-based nanosensor technologies at the University of Bologna, followed by a presentation at the CARLA360 Health Symposium in Bratislava, highlighting PickMol™ nanotechnology for real-time, field-ready pest detection across agriculture, environment, and food systems.

Thank you for following PurPest!
Together, we advance early detection and sustainable plant health protection.
– The PurPest Team!

For recent news and updates follow us: