



Photo: Fruit Logistica

QCAP at Fruit Logistica

To meet the end users of their detector, QCAP researchers presented their work at a booth on Fruit Logistica, the leading trade fair for the fresh produce global market.

Fruit Logistica was held at the beginning of February in Messe Berlin and welcomed over 3,000 exhibitors and almost 80,000 trade visitors. The event covers the full spectrum of fresh fruit and vegetable sector. Over the years, Fruit Logistica has become a meeting platform for producers from around the globe, looking to invest in technology or knowledge transfer and networking.

Frans Harren and Qing Pan from the Radboud University in Nijmegen, The Netherlands, explained how laser spectroscopy can be used to measure multiple gases simultaneously in

real time. Several researchers visited the stand to meet the future of the next-generation gas-analysis. Moreover, a number of commercial companies were also interested in the new technology, such as Appelriket from Sweden. This was a good opportunity for the QCAP researchers to discuss the market value of a system like QCAP.

QCAP was presented at the booth of Storex, the QCAP partner responsible for the validation of the laser spectroscopy system. At the booth, Storex presented the mobile device which is developed to validate the QCAP system, called the DCS Pro. Many visitors were attracted by the futuristic and practical design of the mobile device. By explaining the purpose Storex could easily introduce the QCAP project.

During the exhibition, the QCAP partners welcomed more than 100 visitors with different kinds of interest. The global trend is that producers are interested in better storage and control of their fruit quality, varying from apples, pears and blueberries till dates, kiwi's and aquacates.



Storex booth at Fruit Logistica

VBT contributes to sustainable innovation in horticulture via QCAP



Luc Vanoirbeek

Associate partner VBT (Association of Belgian Horticultural Cooperatives) is an umbrella and forum organisation for the horticultural sector in Belgium. Via its members, the organisation attends to more than 80 per cent of the Belgian fruit and vegetable producers. General secretary Luc Vanoirbeek elaborates on the position of VBT in the horticulture sector and the role of VBT in the QCAP project.

“Our field is highly competitive. Only by offering consistently high quality, we can stand out.”

What does the VBT do for Belgian horticulture?

“First and foremost, we collect and distribute sector-specific data to inform our members about the recent trends in the field. For instance, we map the development of the price and volume per species. We also provide a common direction: we research potential markets, organise practical matters, and ensure that the quality requirements are included in the central guidelines. These guidelines are aligned with our neighbouring countries as much as possible. Our third important task is defending the interests of our members in Belgian and European politics.”

What are your most important areas focus areas at the moment?

“Currently, we are conducting market research in Mexico. We’ve recently set up new markets in Vietnam, China and India, among others. Another focus area is the coordination of our quality specifications, which contain agreements on the implementation of national or European policy, with international equivalents such as Globalgap and Q-S. In doing so, we can jointly safeguard the European quality requirements. We are also working on our campaign ‘Responsibly Fresh’, aimed at promoting sustainable entrepreneurship. Producers increasingly focus on sustainable cultivation techniques and applying new technology. A great example of this development is the QCAP monitoring system.”

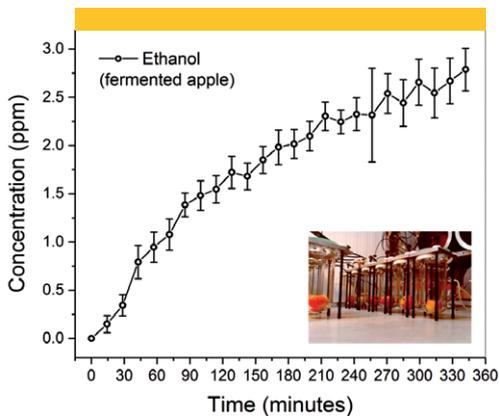
How did you get involved in QCAP?

"We got involved via VCBT (Flanders Centre of Postharvest Technology), a collaboration between the VBT and University of Leuven. VCBT has a unique research infrastructure for storage in a controlled atmosphere and an elaborate lab containing advanced measuring equipment for every kind of quality aspect of fruits and vegetables. VCBT is a partner of the QCAP project and conducts research, thereby VBT has become associate partner."

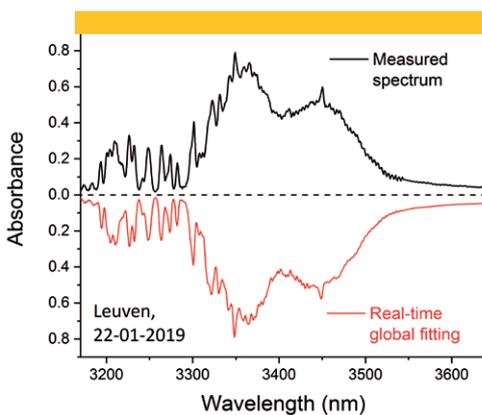
How important is monitoring of product quality to your members?

"Product quality is an important cornerstone of the horticultural sector. Our field is highly competitive. Only by offering consistently high quality, we can stand out. An advanced monitoring system really makes a big difference in doing so. Additionally, it helps us reduce our losses, which contributes to our sustainability objective and the price/quality ratio of the products."

Radboud University delivers the first QCAP trace gas sensor prototype



Ethanol emission from fermented apples detected from the QCAP sensor.



First ethanol absorbance spectrum (black curve) and the associated fit (red curve) obtained at VCBT using the QCAP sensor.

After iterative rounds of optimization and validation, Radboud University has managed to develop the first QCAP sensor prototype. All the functional subcomponents have been fully integrated into a transportable platform, and the system has been successfully delivered to the Flanders Center of Postharvest Technology (VCBT) for real-time trace gas sensing.

R&D seldom proceeds as straightforward as initially thought, and the footprints of the QCAP sensor are certainly no exception. Within the past two years, the QCAP researchers at Radboud University have re-designed the hardware/software architecture, leading to the realization of the first robust, compact, and sensitive QCAP sensor prototype.

This prototype features a bright and broadband mid-infrared supercontinuum light source provided by NKT Photonics. The researchers integrated a reference photodetector into the spectrometer to counterbalance the power drift of the light source, improving the long-term stability of the sensor. The complex gas handling system in the prototype is specially designed for applications in VCBT, where small (~10 L) and middle (300 L) sized storage containers are mostly utilized. A versatile water trap is also implemented, allowing the detection of multiple gas species with reduced water interference. Remarkably, preliminary laboratory-scale apple fermentation experiments show very promising results with high reproducibility, successfully achieving sub-ppm sensitivity for ethanol detection.

Concerning the 210 km journey from Radboud University to VCBT during one of the coldest days of the past winter, it came as no surprise that the sensor prototype fell into hibernation at -4 °C. Fortunately, the warm welcome atmosphere of the local researchers awakened it, and more excitingly, the first broadband ethanol absorption fingerprints appeared at the sunrise horizon after overnight darkness.

Measurements associated with the first trial for a real pear storage container show very promising results. Ethylene concentration of 45.3 ppm has been successfully detected by the QCAP sensor prototype, in excellent agreement with the expected concentration of 43.5 ppm validated by gas chromatography-mass spectrometry (GC-MS). Controlled experiments involving various other gas species are currently underway, and the feedbacks will be valuable for developing and improving the second sensor prototype for potato storage applications in Cranfield University.



The research will be presented in the Conference on Lasers & Electro-Optics / Europe (CLEO Europe) upcoming June in Munich.

Meet Lucy Hooper, Optical Team Leader at NKT Photonics

What is your expertise?

"NKT Photonics is the world's leading supplier of supercontinuum fibre lasers. The Mid-IR supercontinuum product line has been in development for a number of years, and was released onto the market in 2017. I lead the Mid-IR laser product development in the UK, designing next generation Mid-IR lasers."

Why do you participate in the QCAP project?

"Gas spectroscopy is a major application area for our Mid IR supercontinuum lasers, so participating in this project is opening up our awareness of industries where our technology could be useful and is also providing us with the feedback required to optimize the laser design to better suit this application."

What is your most important challenge in this project?

"Working closely with the team at Radboud University to understand the requirements of



Lucy Hooper

the laser to ensure the most accurate possible detection once the laser is integrated into the monitoring system. The laser must output high intensity light over the correct wavelength range in order to cover the absorption bands of several key gas phase species."

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