

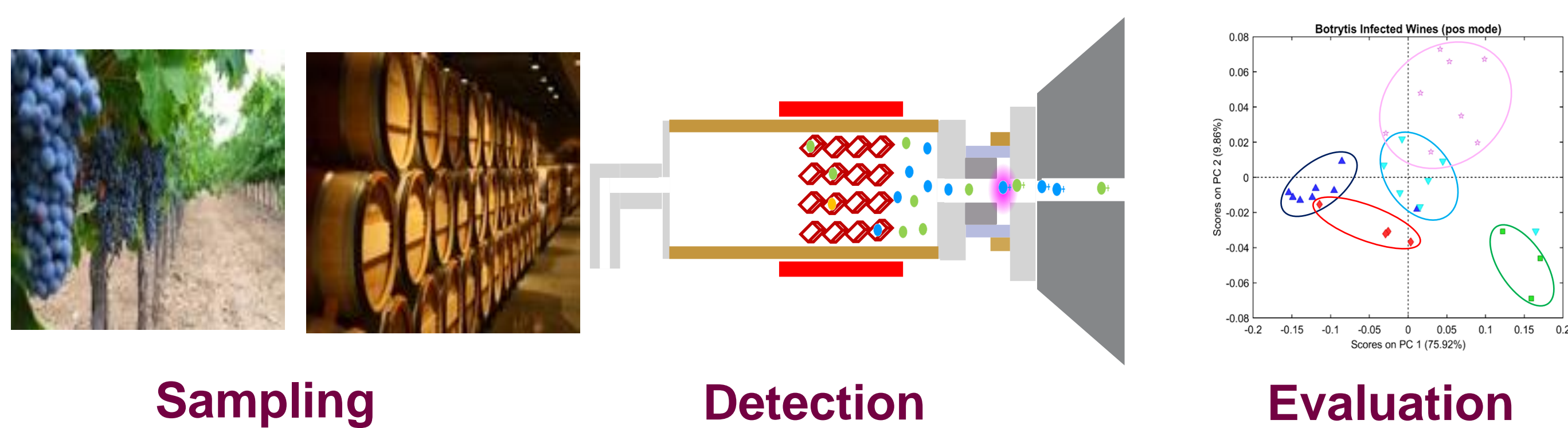
# Zeolitic imidazolate framework-8 as alternative adsorbent material in capturing volatiles from wines and grapes

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## Our work

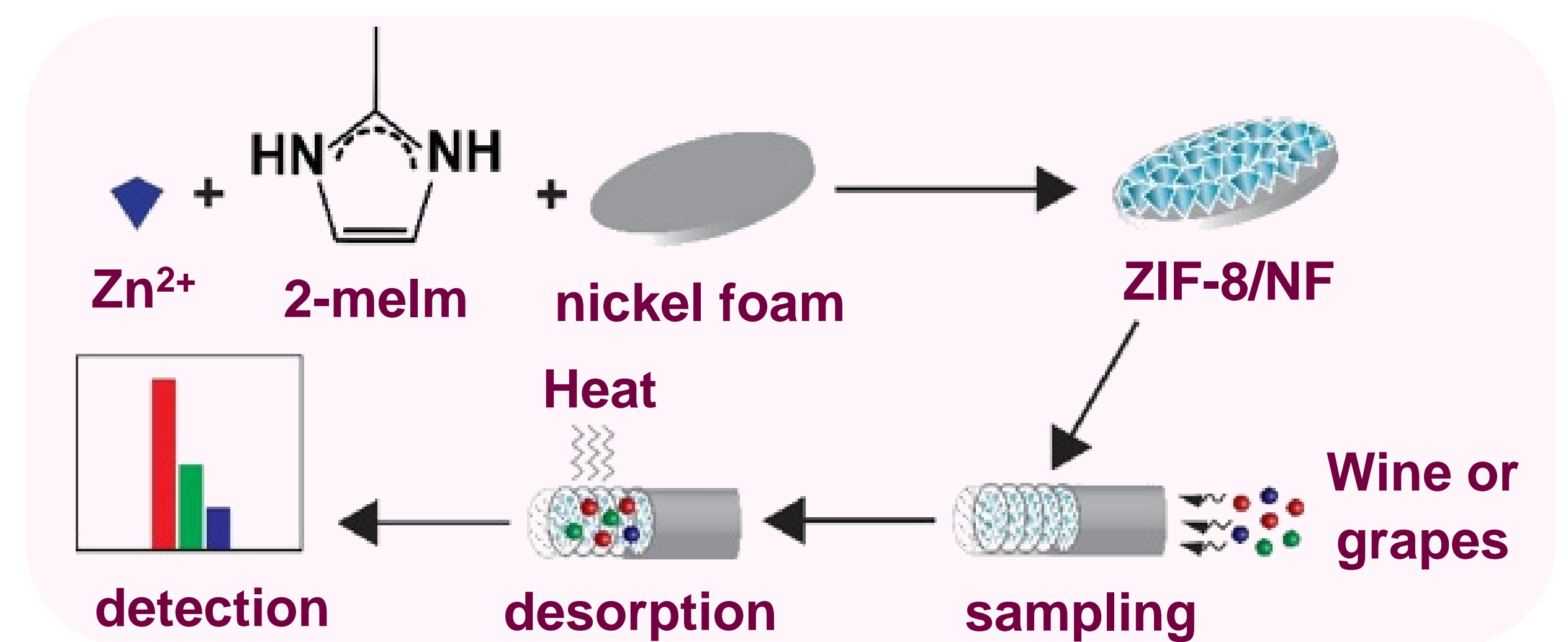


**Figure 1.** The over-all strategy of our work is to support timely management decisions by providing a rapid and direct technique for quality assessment of wines and/or grapes.

- Metal-organic frameworks (MOFs) have a nano-sized crystal with ultrahigh surface area, thermally stable and diverse structural functionality. It can be used as a selective adsorbent material for volatile compounds.
- Zeolitic imidazolate framework-8 (ZIF-8) is resistant to humidity making it an ideal MOF for field sampling to capture low abundance volatile signatures from samples prior to instrumental analysis.<sup>1</sup>

## Our approach

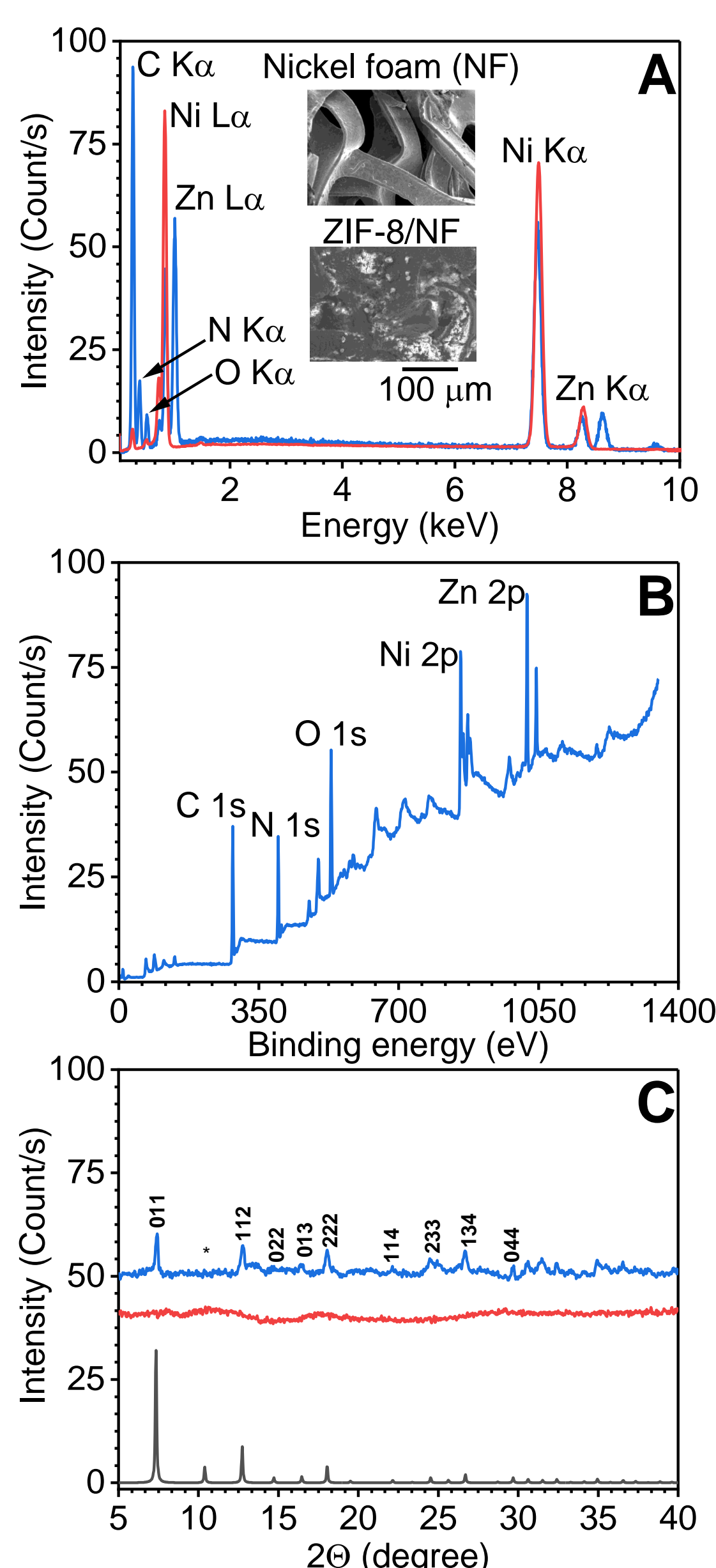
- Developed, synthesized and characterised ZIF-8 to capture low level volatiles.<sup>2</sup>
- Packed ZIF-8 in sampling tubes and conditioned.
- Collected volatiles in the field or directly from the sample (e.g., wine).
- Coupled the sampling tubes to GC-MS or directly into the custom-built ambient plasma-based mass spectrometer for detection.



**Figure 2.** Synthesis and sampling/detection process.

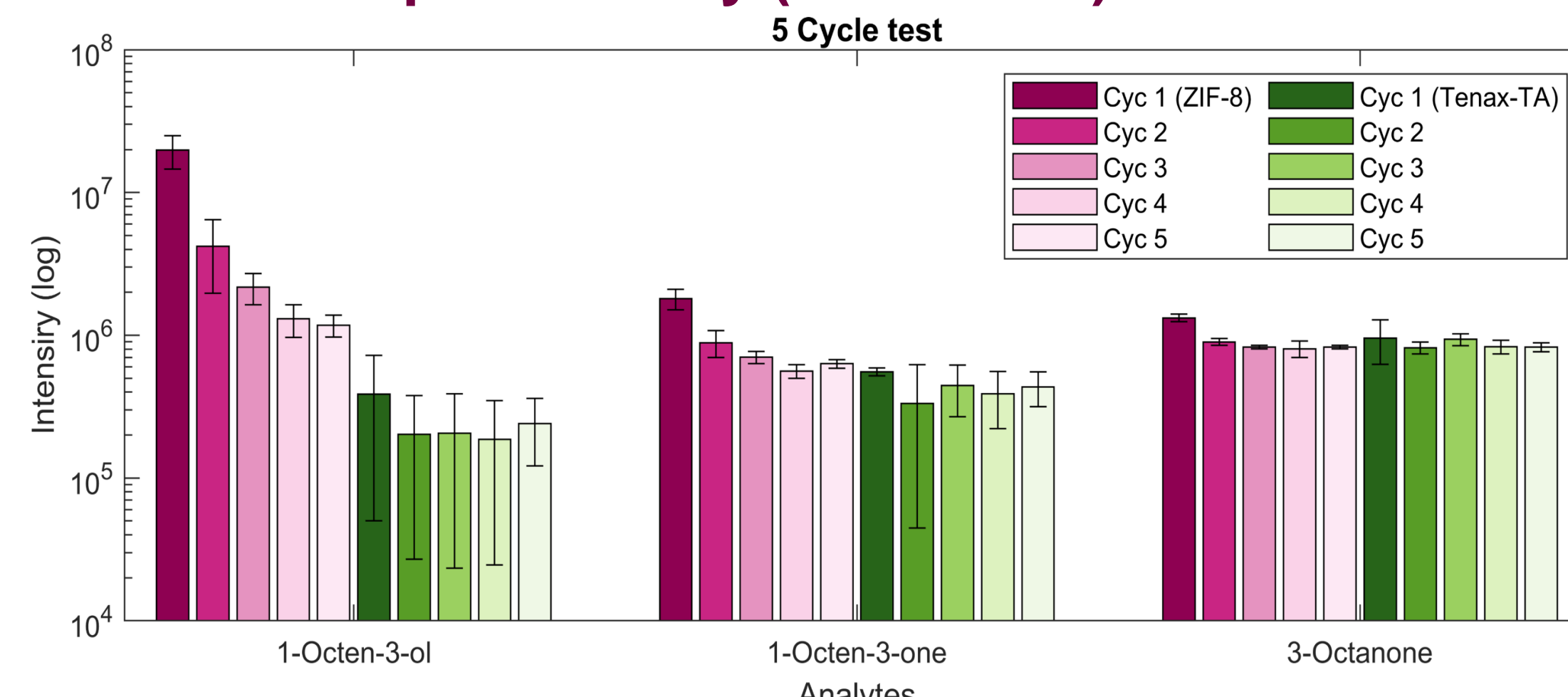
## Our key findings

### Material characterisation<sup>3</sup>

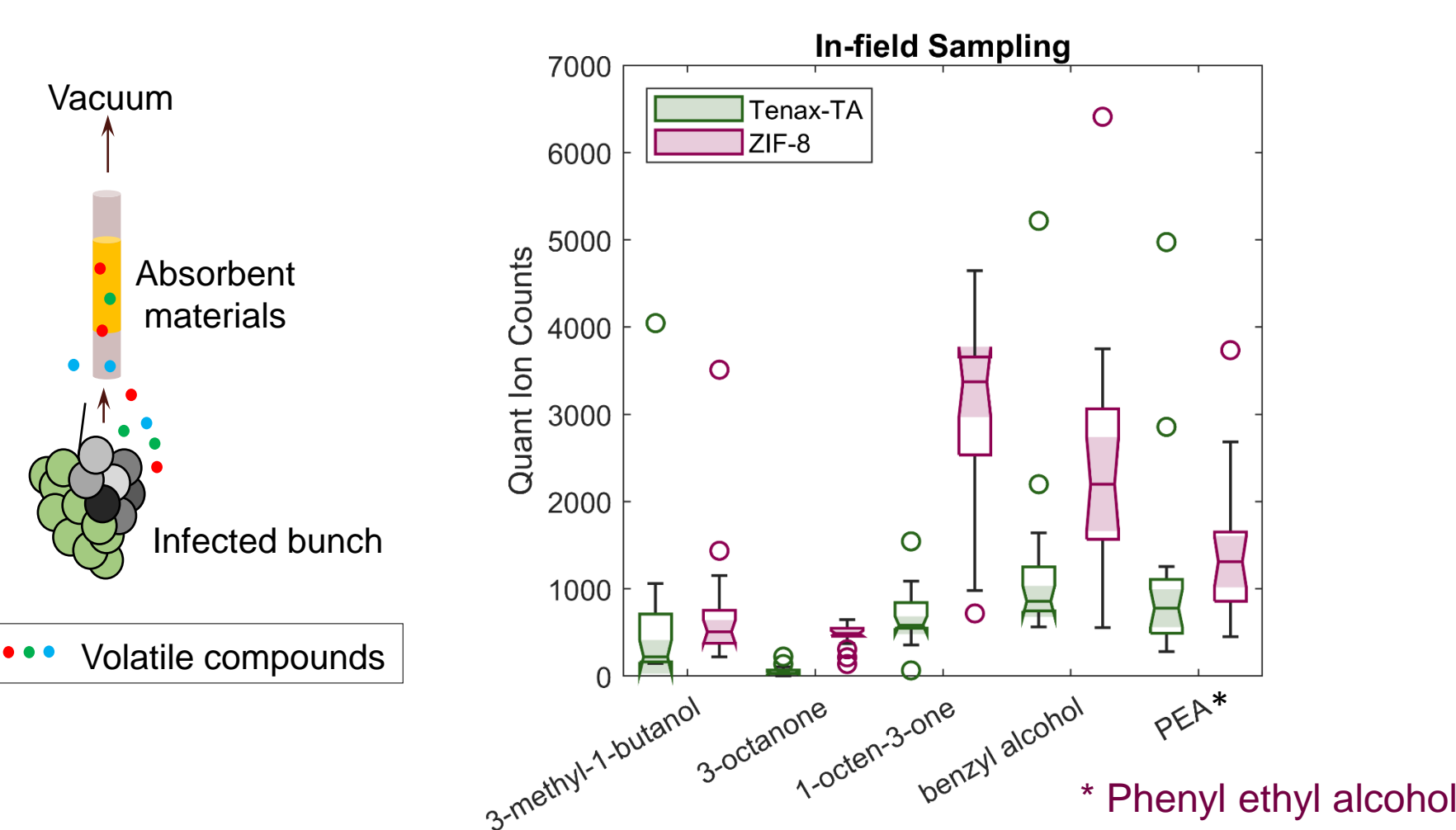


**Figure 3.** The sorbent material was characterised to verify the identity by using a) SEM-EDX, b) XPS and c) XRD. ZIF-8/NF (blue), nickel foam (red) and XRD reference pattern (black).

### Thermal desorption – Gas Chromatography Mass spectrometry (TD-GC/MS)

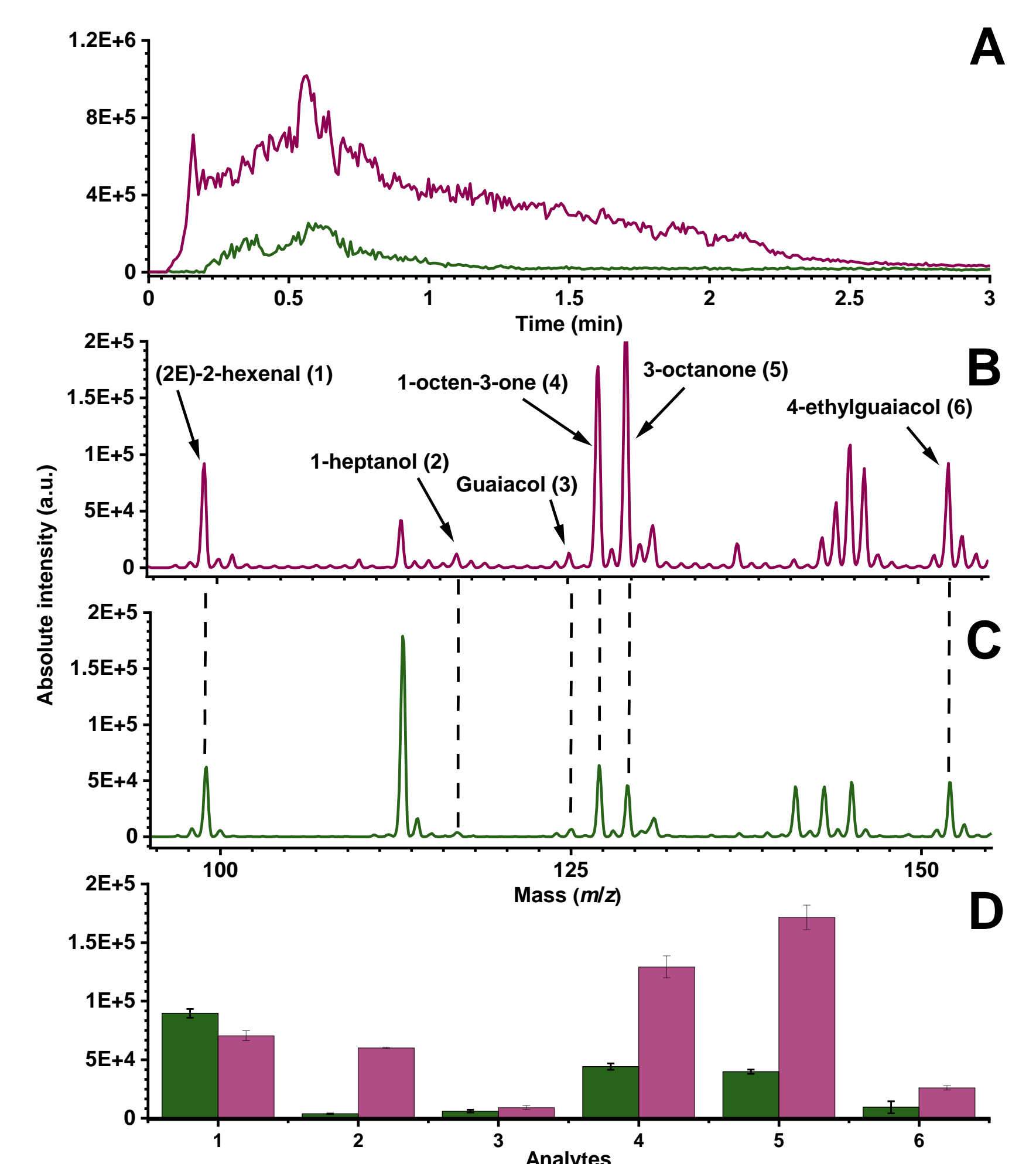


**Figure 4.** Stability of ZIF-8/NF (purple) as compared with Tenax-TA (green) by repeat use of the sorbent to measure a standard mix of target analytes using TD-GC/MS technique.



**Figure 5.** Efficient trapping of low level volatiles using ZIF-8 for in-field sampling (photo left) compared to Tenax-TA.

### Direct coupling of new material to mass spectrometry



**Figure 6.** Rapid detection of analytes in less than 2 mins (a) total ion chromatogram of ZIF-8 (purple) and Tenax-TA (green), and (b & c) MS spectra. Overall, ZIF-8 improved the detection sensitivity (d) bar graph of different ion detection.

**References:** <sup>1</sup>Burch, N. C.; *et al.*, Chemical Reviews 2014, 114 (20), 10575-10612; <sup>2</sup>Chen, Y.; *et al.*, Angewandte Chemie International Edition 2016, 55 (10), 3419-3423; <sup>3</sup>Verougstraete, B., *et al.*, Frontiers in Chemical Engineering 2020, 2 (16).

## Our conclusion

ZIF-8 is a zinc based sorbent material that shows superior performance for capturing and detecting target volatile compounds compared to the commercially available Tenax. ZIF-8 will improve detection of important target volatile compounds and dramatically reduce instrumentation time when coupled directly to an ambient MS technique. This approach could be utilised for non-destructive in-field sampling prior to harvest or support timely management decision.

### FOR MORE INFORMATION

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