

What are the keys to effectively combating illegal and counterfeit pesticides?

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Context

Counterfeit pesticides may contain less active substances, or impurities or co-formulants that are banned because of the risk to human health and the environment.

The **DEPIPEST** project has the aim of demonstrating the feasibility of a coordinated fight against counterfeit pesticides which would be based on the development of **MIR and RAMAN spectroscopy methods** and the establishment of a **spectral database** of legally authorized formulations in Belgium, as well as on the development of **screening / profiling chromatographic methods**.



An hypothetical situation ? Measurement of a pesticide formulation using a portable Raman device in a warehouse

1 - Reducing the administrative burden is a first step

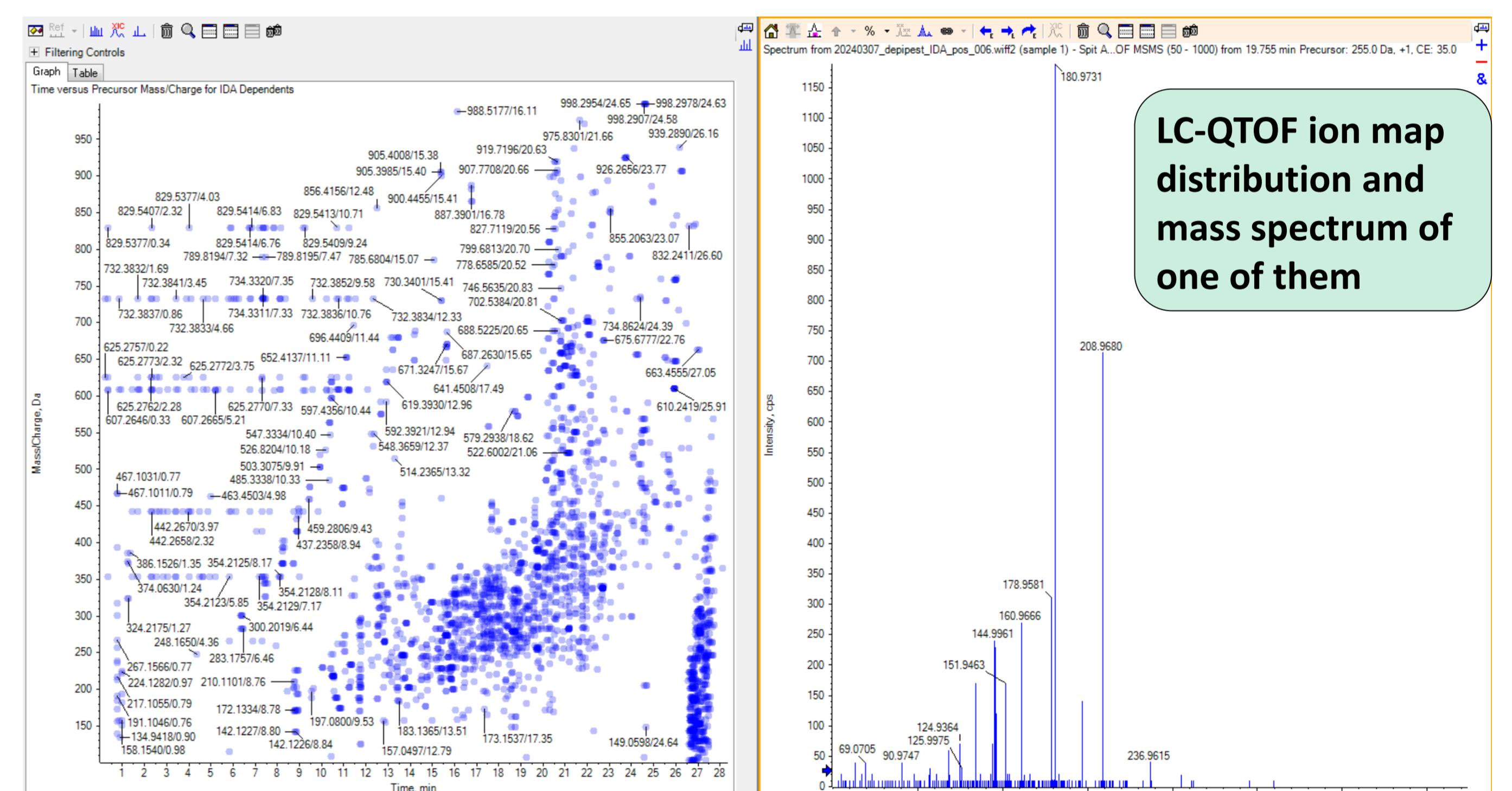
Our bibliographical review of regulations shows their complexity, the lack of interconnection between administrative databases and the great diversity of the competent international, European and national authorities involved.

2 - The analysis of numerous illegal and genuine formulations is a major factor for success

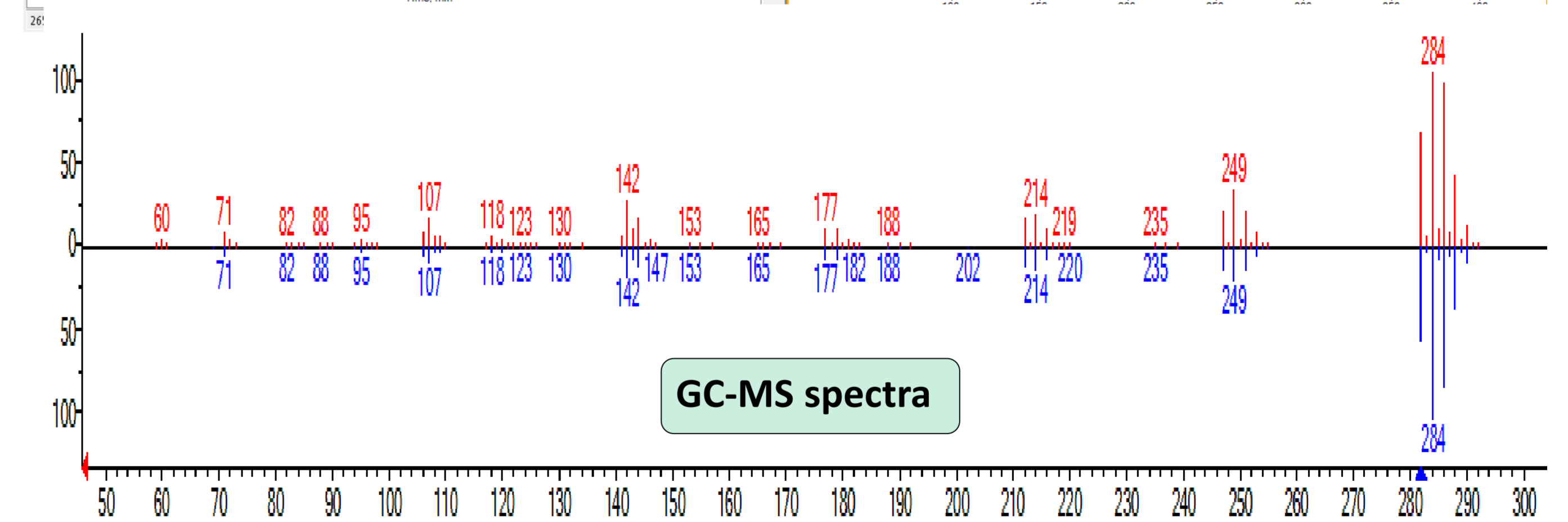
We analysed 400 samples of authentic formulations, formulations monitored by the Federal Agency for Safety of the Food Chain and formulations that we deliberately adulterated. We considered the determination of active substances, relevant impurities, certain co-formulants or the complete profile (fingerprint, screening / profiling) of formulations, and the comparison to authentic, parallel import or counterfeit formulations.

3 - One of the urgent needs is a rapid, inexpensive screening system that can be used directly in a pesticide warehouse

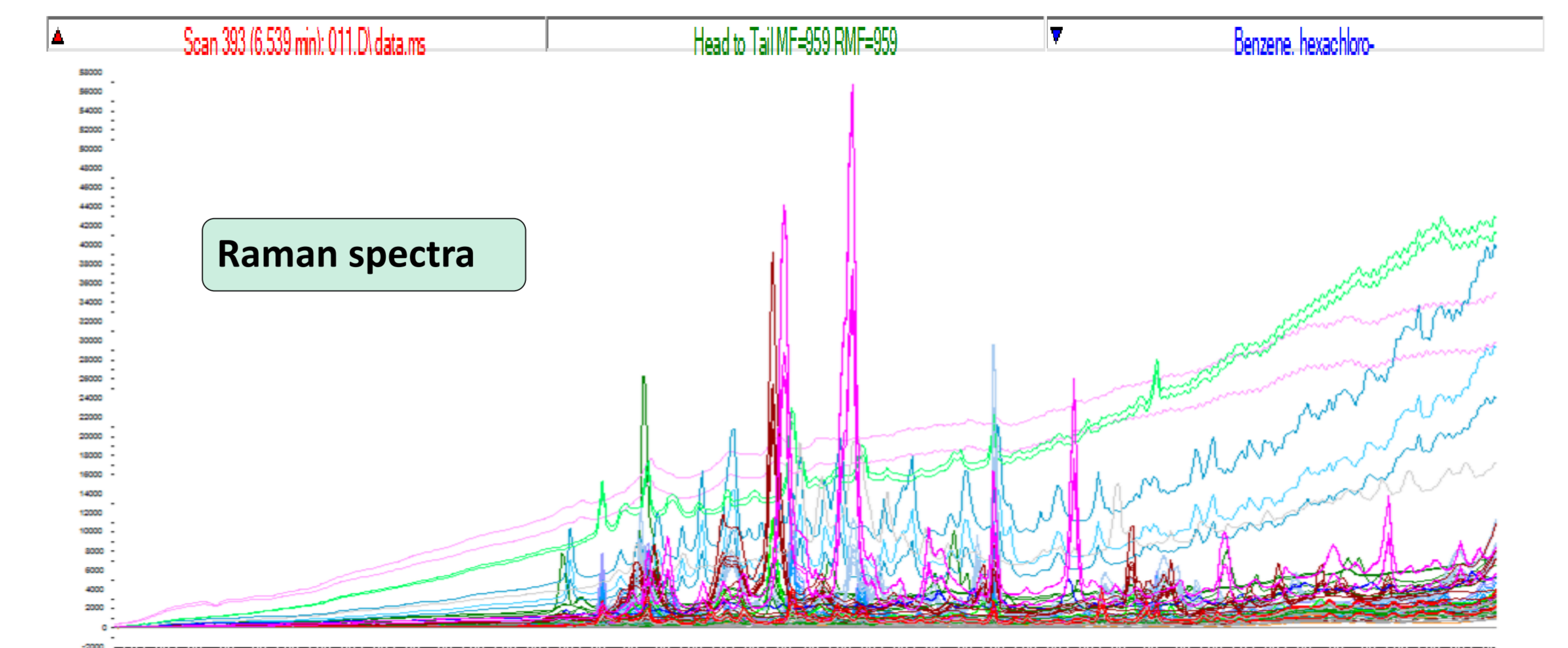
The DEPIPEST project combines rapid screening by vibrational spectroscopy (MIR, RAMAN) with the chromatographic confirmation (**GC-FID, GC-MS, UHPLC-UV/MS, LC-HRMS**) of samples deemed suspect during screening. We tested several devices (**MIR-ATR, FT-Raman, handheld Raman, Raman microscopy**) and sample presentations. Statistical processing using main component analysis provides encouraging results for formulation identification. We plan to develop chemometric and machine-learning techniques to take full advantage of spectroscopic analyses.



LC-QTOF ion map distribution and mass spectrum of one of them



GC-MS spectra



Raman spectra

4 - Finally, another essential point is the setting up of a database linking administrative information on pesticides with their spectroscopic and chromatographic analytical data

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