

## **A multi-technical initiative to authenticate analytically organic food products: the True Organic Food (TOFoo) project**

E. Jamin

*Authenticity Laboratory Manager, Eurofins, Nantes, France*

From a niche market, the organic sector has become a global market with long supply chains and intercontinental trade, rewarding players with a significant price premium. As a consequence, it is facing vulnerabilities to fraudulent activities, as shown by the police operation Opson VIII, affecting authenticity of these food products and impacting adversely consumer trust. Indeed, the recent "Barometer of organic products in France - 2023" of the Agence Bio, pointed out that consumers have more doubts on the organic products' integrity, it is now the second hindrance to buy organic products, just after the price.

Up to now, no analytical method could determine in routine conditions whether a product was organic or not. Non-targeted analyses have a promising potential for overcoming this challenge. A large-scale initiative called True Organic Food (TOFoo), led by Eurofins, supported by 10 partners and with financial support from the French funding agency Bpifrance, has been launched mid-2020 to develop and validate such methods. The challenge was to design such non-targeted multi-technical methods and to demonstrate high sensitivity and specificity on a large number of representative samples, to ensure that all the diversity which can be found in organic food products could be encompassed.

A combination of high resolution techniques was tested, including liquid chromatography-mass spectrometry (LC-HRMS), nuclear magnetic resonance (NMR) and isotopic ratio mass spectrometry (IRMS). Thousands of authentic food products were collected along with metadata on agricultural practices. The first results were applied to UHT milk and tomatoes. The AI (neural networks) and statistical models classify correctly more than 90% of the samples according to the production system. Future developments will deal with other food products, such as grains and apples.

Along with traceability tools, these new tools will better guarantee that only authorised practices have been used along the supply chain, thus increasing trust in the organic production system. In the move from a best-efforts obligation towards a performance requirement, they will become valuable tools for demonstrating, with science based-evidence, that organic specifications are met.

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E-mail: [EricJamin@eurofins.com](mailto:EricJamin@eurofins.com)