



Organic World
Congress 2020

FRANCE

SEPTEMBER 21ST TO 27TH, 2020 IN RENNES

AT THE COUVENT DES JACOBINS • RENNES MÉTROPOLE CONFERENCE CENTRE

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OWC 2020 Paper Submission - Science Forum

Topic 2 - Product and process quality in Organic Agriculture: methods and challenges

OWC2020-SCI-696

A MULTI-TECHNICAL INITIATIVE TO AUTHENTICATE ANALYTICALLY ORGANIC FOOD PRODUCTS: THE TRUE ORGANIC FOOD (TOFOO) PROJECT

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Preferred Presentation Method: Oral or poster presentation

Full Paper Publication: Yes

Abstract: The organic sector is facing vulnerabilities to fraudulent activities. New analytical tools are needed for authenticating the production system. Non-targeted analyses, based on a multi-techniques approach, have the potential to overcome these hurdles. A large-scale initiative called True Organic Food (TOFoo), led by Eurofins, has been launched to develop and validate such methods. New tools may be available for use in the whole organic sector. Together with other traceability tools, they may better guarantee that only authorised practices have been used along the supply chain. It will also increase the protection of virtuous players and support the sustainable growth and dynamism of the organic sector.

Introduction: The organic sector, which has grown by 8.5 % in Europe between 2000 and 2016, is changing at a high pace. From a niche market, it 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 recent police operation Opson VIII [1], affecting authenticity of these food products and impacting adversely consumer trust. Transparency and integrity have been acknowledged as key features for the future of the organic movement in the prospective study Organic 3.0 [2]. Unfortunately, up to now, no analytical method can determine in routine conditions whether a product is organic or not [3]. Non-targeted analyses have a promising potential for overcoming this challenge. Proofs of concept have been published demonstrating, on a set of up to a few hundred samples, their technical feasibility [4–6]. The literature also suggests that the combined examination of analytical profiles with different techniques improves authentication of organically produced food [7]. The challenge today is to design such non-targeted multi-technical methods and to demonstrate high sensitivity and specificity on a large number of ordinary samples, to ensure that all the variety which can be found in organic food products is encompassed.

Material and methods: A large-scale initiative called True Organic Food (TOFoo) was launched earlier this year for developing innovative tools to meet the authenticity needs in the organic sector. A multi-disciplinary consortium, led by Eurofins, brings together 10 partners, including companies and academia active in the field of analytical sciences, and two

major food companies. It has started to work on this 5.5-year R&D project with a budget of over € 17 millions with financial support from the French funding agency Bpifrance.

The goal of this project is to design and validate analytical methods for authentication of organic plant-based and dairy food products. The technical approach is non-targeted. A combination of high resolution techniques will be tested, including liquid chromatography-mass spectrometry (LC-MS), gas chromatography mass spectrometry (GC-MS), inductively coupled plasma mass spectrometry (ICP-MS), nuclear magnetic resonance (NMR) and vibrational spectroscopy. In short pilot studies, all these techniques will be applied on a set of samples. Only the most informative will be kept for further development and validation according to the NF V03-110 standard and accreditation requirements. Collecting thousands of authentic food products along with metadata on agricultural practices will be necessary for building databases. After analytical procedures, a huge amount of data will be generated and explored through linear statistical models or deep learning approaches such as neural networks for classifying samples according to the production system.

Results: The project was launched early this year. Only a few results have been generated so far. However, the validation of the first method is expected in 2022. It may become available in routine analysis one year later.

Discussion: The multi-stakeholder initiative TOFoo, which brings together partners with different technical backgrounds, is facing the huge challenge of designing and validating analytical methods for organic food authenticity. However, it has the potential to overcome these technical hurdles.

If successful, the project will generate new tools available for use by any stakeholder in the whole organic sector (producer, retailer, certifier, etc.). Along with traceability tools such as blockchains, they 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.

It will also increase the protection of virtuous players, support the sustainable growth and dynamism of the organic sector, especially in foreign markets, and leverage the environmental and socio-economic benefits of the organic agriculture. The TOFoo project has received funding from the Bpifrance PSC research and innovation programme.

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Disclosure of Interest: E. Jamin is employee of: Eurofins, received grant/research support from: Bpifrance, J.-F. Morin is employee of: Eurofins, received grant/research support from: Bpifrance

Keywords: analytics, authentication, dairy product, multi-techniques, plant-based food, statistics