

Metrology in support of food safety: validation of targeted and screening methods for the detection of PFAS in rice and maize

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Per- and poly-fluoroalkyl substances (PFAS) are applied to food packaging and other materials to provide fat, fire, and/or water resistance properties. Emissions of PFAS from industrial wastes lead to environmental contamination. These compounds are known as "forever chemicals" due to their stability and persistence. PFAS are expected to have carcinogenic and reprotoxic effects on humans. Every day, PFAS may come into contact with people through the environment, food, and water. In summer 2022, the European Union moved forward in the fight against PFAS contamination in food and feed [1-3].

There is a need to develop increasingly sensitive and accurate analytical methods to investigate contamination levels of PFAS in the food chain to control food quality, preserve the product's safety, and prevent economic losses. The metrological approach is of paramount importance due to the lack of harmonisation and traceable methods.

The aim of this study is to use a metrological approach to assess the level of PFAS contamination in rice and maize samples.

The analytical method is developed on UHPLC-HRMS performing the isotopic dilution approach. All the standards were CRMs. The samples were extracted, purified and directly injected into the HPLC system. The calibration curves for the targeted method were built considering the whole budget of uncertainties. The untargeted (screening) approach was performed matching results of FullMS experiment with database and dedicated software. The method has been demonstrated to provide robust, reproducible, and reliable results.

The outcomes of the targeted analysis obtained due to the linear regression resulted in a calculated average LOQ for the 21 PFAS and the 4 regulated by EFSA of 30 ng/kg and 10 ng/kg, respectively. The screening approach allowed the identification of all the new synthetical PFAS contaminants (GenX and similar) in the samples. The sensitivity, recovery and selectivity parameters obtained showed that the validated method is suitable to assess the levels of contamination of PFAS in this kind of matrix. The method was tested with proficiency testing samples from EURL-POPs. The metrological approach will be performed with real samples to assess the level of contamination in northwest Italy.

Keywords: PFAS, UHPLC-HRMS/MS, Food safety, Metrology, Food contamination

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References

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