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Application of GC(xGC)-TOF-MS for the early detection of non-conformity and fraud: potentially contaminated fat sources for feed

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The quality and safety of feed materials produced within or outside the EU has been recognised to be of paramount importance to securing safe and wholesome food to the European consumer. Due to financial constraints, the quality controls are mainly conducted at laboratory level and only address specific (regulated) parameters such as PCBs and PAHs, which limit their capacity to detect unforeseen problems. Therefore, there is an urgent need to investigate ways to combine existing testing methods and emerging technologies into a comprehensive analytical strategy for the early quality and safety assurance in the feed chain. New separation technologies based on ultra high performance liquid chromatography combined with high resolution mass spectrometric detection (e.g. UPLC-TOF-MS, UPLC-Orbitrap-MS) and comprehensive gas chromatography combined



with mass spectroscopy (e.g. GCxGC-TOF-MS) can be applied for fast full scan analysis of feedmaterials. Until now, this full scan information has mainly been utilized for library-based targeted multi-class screening and confirmation of known contaminants [1]. However, these techniques also have high potential for semi-targeted and untargeted fingerprinting [2]. The aim of this work is adaption of existing GC(xGC)-ToFMS methodology for the early detection of non-conformity of fat sources for feed. The idea was to obtain as much information as possible out of one single analysis. First an existing sample preparation procedure for fish [3] was adapted and validated for combined determination of PCBs, PAHs, PBDEs and mineral oil in various types of fats (feed grade and non-feed grade: raw/processed plant oil, fish oils, animal fats, distillates from chemical and physical oil refining, oils recovered from bleaching earths, by-products from oleochemical processing and biodiesel production, etc). Next, a number of data processing scripts were adapted and developed [4] to detect and classify chlorinated- and brominated- substances, and other PAHs-derivates, through their characteristic isotope patterns. Furthermore, the feasibility of using all the generated data to classify the different types of fats/oils or types of processing either through known markers or through profiles was evaluated. The adapted methodology allows efficient comprehensive screening of fat ingredients for feed, combining the determination of regulated-, emerging contaminants and adulterants and classifying suspect non-conformity feed samples through semi-targeted detection of unknown contaminants.

Keywords fat;GC(xGC)-ToFMS;PCBs;contaminants adulterants

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