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EXPLOITING THE COMPLEXITY OF FOOD AROMA BY COMPREHENSIVE TWO-DIMENSIONAL GAS CHROMATOGRAPHY COUPLED TO TIME OF FLIGHT MASS SPECTROMETRY FEATURING TANDEM IONIZATION

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The process of chemical fingerprinting can substantiate quality differences arising from botanical and geographical origins of primary food ingredients, the impact of post-harvest practices and production processes (traditional vs. industrial) as well as shelf-life evolution of finished products. Any analytical platform and/or methodology capable of a comprehensive coverage of chemical traits of food when they are related to the perceived quality –sensory quality, raw material authenticity and processing impact – will contribute to the fundamental step of quality assessment and provide solid foundation for consumer-tailored strategies to improve acceptance and loyalty.

This contribution discusses the strategic role of comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry (GC×GC-TOF MS) featuring tandem ionization and accompanied by pattern recognition using template matching for data processing to unravel the quality traits of high-quality food.

Examples, taken from authors research experience, deal with high-quality cocoa, a food commodity of global economic interest, and extra-virgin olive oil, a local commodity of strategic relevance for the Mediterranean producing countries (Spain, Italy, Greece, Tunisia). Both commodities have an intrinsic added value related to their flavor profiles and perceived qualities, that are 80-90% due to aroma-active compounds. Likewise, the origin and processing signatures are of great help in driving industrial strategies in products reformulation and blending.

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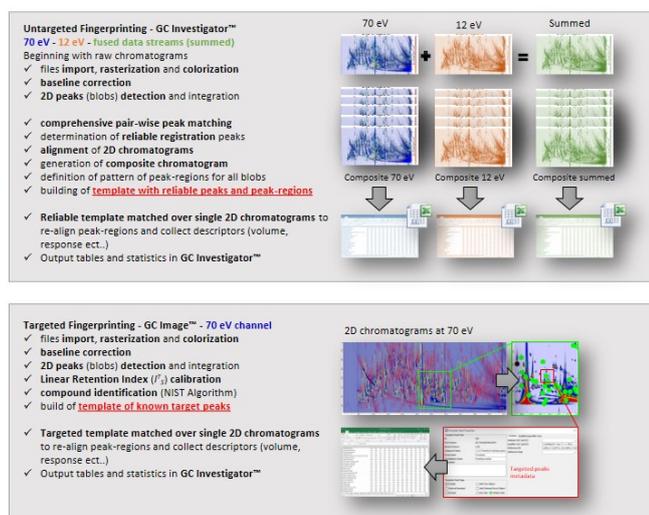


Figure 1. Tandem ionization data exploration by untargeted/targeted *UT fingerprinting*

The approach known as un-targeted/targeted fingerprinting (i.e., *UT fingerprinting*) based on single and tandem ionization data streams is explored and tandem signals examined for their information potential (schematic illustration in Figure 1) in terms of products aroma, technological signature and geographical origin peculiarities.

The advantages of a true multidimensionality, from sample preparation (the zeroth dimension of an analytical system) to separation (GC×GC) and analyte detection and identification (TOF MS and tandem ionization) are discussed also in the perspective of a modern approach to food quality assessment where analytical chemistry would play a pivotal role.

References

- [1] Dunkel A., Steinhaus M., Kotthoff M., Nowak B., Krautwurst D., Schieberle P., Hofmann T. *Angew Chem Int Ed.* 2014;53(28):7124-43.
- [2] Cordero C., Kiefl J., Reichenbach S.E., Bicchi C. *TrAC Trends Anal Chem* 2019;113:364-378