Abstract

Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) are, together with Traditional Speciality Guaranteed (TSG), the instruments created by the European Union (EU) to protect Geographical Indications (GIs) within the European framework as indications which identify a good as originating in a specific location, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin. Food products with a protected geographical status distinguish from other similar products of the same category for the link with the region they originate from. Despite the improvement this quality scheme provided to the protection of unique foodstuff, the threat of food fraud is still present and sophistication of adulteration of food products is making the utilization of the most advanced technologies compulsory for labelled food product protection. Mass spectral characterization of food materials has advanced rapidly in the past few years, mostly due to the development and now routine availability of electrospray ionization (ESI). However, it is now clear that food products exist as complex mixtures and High resolution Electrospray Ionization Fourier transform—Ion Cyclotron Resonance Mass Spectrometry (ESI FT-ICR MS) at high magnetic fields is currently a techniques capable of resolving thousands of individual molecules in few minutes. In this work, a Mass Spectrometry-based phytochemical screening was performed on several traditional food products produced in the Basilicata region (Italy) labelled with geographical indication marks of quality. High Resolution ESI-FT-ICR MS data obtained from food sample analyses were used to perform a rapid evaluation of metabolome by converting accurate m/z values in putative elemental formulas. Molecular formula maps, or *molecular fingerprints*, were obtained by making 2D Van Krevelen plots, that lead to a direct identification of different classes of metabolites. The presence of important metabolite classes, i.e. fatty acid derivatives, tannins, amino acids and peptides, carbohydrates and polyphenolic derivatives, was assessed. Moreover, differences among Van Krevelen plots could be noticed from their direct comparison, thus reflecting differences in promoted biochemical pathways and suggesting the presence of biomarkers, that can eventually be identified by a target approach. Thus, molecular fingerprints prove to be an innovative tool that could be useful for food authentication and traceability.