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Authenticity and quality control of spices and herbs by automated ¹H-NMR spectroscopy and statistics

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Ensuring the authenticity of food has been a challenge for decades. Many spices and herbs are high-priced products, predestined for being blended with low(er) value ingredients. And latest examples show that even lower-priced goods are not invulnerable to adulteration. The emergence of more and more sophisticated food analysis techniques has dramatically forced back overt falsifications, but is inevitably a trigger to subtilize adulteration methods. The key to profile food quality economically, and increase the detection rate of smart adulterations is a fast and efficient analytical technique which is able to cover the range from whole matrices down to single compounds. Due to its unique all-in-one capabilities, automated high-resolution ¹H-NMR spectroscopy, combined with multivariate statistical chemometrics, is the screening methodology of choice for food quality, authenticity and safety control. As ¹H-NMR is intrinsically quantitative only one quantification reference for all NMR-detectable components in a mixture is required. Yielding targeted quantification of selected compounds as well as untargeted fingerprinting in a single run, NMR is a specific and holistic method likewise. Its supreme reproducibility enables worldwide lab-to-lab spectra comparison and collective database buildup. Unlimited data re-processing is given and allows applying future statistical algorithms, re-modeling of more or different parameters, or retrospective quantification of mixture components not in the focus of interest at present. This methodology, yet commercially applied and ISO-17025 accredited for fruit juice, wine, and honey screening, is now under development for spices and herbs profiling. The principles behind this NMR methodology as well as recent applications and results on several spices and herbs are presented.

Biography

Andrea Steck has 30 years of expertise in NMR spectroscopy, in the fields of research, contract customer services, method development, and application likewise, practiced both in university and industry. She also has conducted the process to ISO-17025 accreditation for four matrices in 2015 as quality manager. In a current cooperation project with Arotop Food and Environment GmbH, financially supported by the German Federal Ministry of Food and Agriculture (BMEL), an NMR methodology for authenticity and quality control of spices and herbs is under development.

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