

## **Development of robust and affordable non-targeted analytical methods to identify and authenticate functional ingredients for the NHP industry**

*ISURA/NRC collaboration.*

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One of the greatest challenges facing the functional food and Natural Health Products (NHPs) industries is sourcing high quality functional ingredients (FIs) for their finished products. For manufacturers there is a known and inherent risk with FIs acquisition as the quality of herbal raw materials and extracts can vary considerably based on how and where they are sourced within the global supply chain. The lack of modernized analytical methodologies, ingredient standards, and industry oversight creates the potential for low quality and in some cases deliberate adulteration of ingredients. DNA barcoding has emerged as one tool to address this problem, but whether or not it is “fit for purpose” for functional ingredients and NHPs have not been established. Consequently, ISURA and National Research Council Canada (NRC) undertook a collaborative study in order to evaluate several chemical based analytical chemistry approaches toward supporting the authentication of botanicals and FIs. The objective of this study was to improve botanical and FI authentication by developing non-targeted analytical methods supported by multivariate statistical analysis that would allow the mining of resulting chemical based analytical dataset to confirm the presence of the expected chemical profile while highlighting the potential presence of unanticipated adulterants.

As part of this collaboration, ISURA and National Research Council Canada investigated more than 150 FIs, botanicals and NHPs; a sample library composed of a wide diversity of samples including fruits, vegetables, botanicals, and herbs as well as various types of products including reference standards, raw organic materials, extracts, and formulated products commonly found on the marketplace. The project led to the acquisition large analytical datasets recorded on orthogonal analytical techniques including nuclear magnetic resonance (NMR), Liquid Chromatography – high resolution mass spectrometry (LC-HRMS), Fourier Transformed Infrared spectroscopy (FTIR), and gas chromatography – flame ionization detection & mass spectrometry (GC-FID-MS).

The processing and the interpretation of the data using both principal component analysis and hierarchical cluster analysis revealed that both mass spectrometry and nuclear magnetic resonance were fit for purpose analytical techniques to fingerprint the chemical composition of the complex mixtures often found in NHPs. In particular, NMR based methodology has shown to be a very robust and reproducible approach as well as a reliable solution to authenticate botanicals and FIs for the NHP industry. The robust nature of NMR data sets make it very suitable for multivariate statistical analysis allowing comparisons of other similar samples while at the same time enabling quantitation of the amount of bioactive natural products present in a sample. Key findings and specific experimental conditions and methods from ISURA/NRC collaboration have been the subject of presentations at the NHPRS meetings and will soon be published in a peer reviewed journal. Stay tuned...