Is it really organic? Authenticity testing of organic plant products using elemental and isotopic fingerprinting

Kristian Holst Laursen and Søren Husted

University of Copenhagen, Faculty of Science, Department of Plant and Environmental Sciences, holst[a]life.ku.dk

The commercial market for high-value plant products is steadily increasing. Consumers are willingly paying premium prices for plants that originate from specific geographical regions or are produced according to certain agricultural management practices. This has significantly enhanced the market shares of organically grown plant products but has simultaneously increased the risk of food adulteration and fraudulent activities. Consequently, sophisticated analytical principles are currently being developed to enable discrimination of organic and conventional plants and ensure compliance with the regulations of organic agriculture. Some of the most promising principles for organic authentication are based on atomic spectroscopy which encompasses several analytical techniques suitable for analysis of the elemental and isotopic composition of plants (1).

Analytical discrimination of organic and conventional plant products relies on an expectation of systematic differences in agricultural management practices. Thus, it has been hypothesized that the prohibition of pesticides and synthetically produced fertilizers in organic agriculture is reflected in the chemical composition of plants. This hypothesis was recently tested in a Danish research project called *OrgTrace*, in which analytical methods for elemental and isotopic fingerprinting were developed and combined with multivariate statistics for authenticity testing of organic crops (2-4). The unique experimental design of *OrgTrace* included numerous plant species grown either organically or conventionally at several geographical locations differing in soil type, climate etc. Furthermore, year-to-year variation was assessed by inclusion of two growth years. Results from the *OrgTrace* project will be presented at the seminar.

Recently, the international research project *AuthenticFood* was initiated. In *AuthenticFood* novel analytical procedures will be tested and combined to enable authentication of selected organic plant products before and after processing of these. The main research hypotheses and methodologies of *AuthenticFood* will be presented.

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