

News story: Review of methods for coffee bean authenticity testing

Why is coffee authenticity an issue?

Coffee is one of the most widely traded tropical products at a global level. Arabica and Robusta are the most popular varieties with Arabica generally favoured by discerning coffee drinkers. With a high market value and commercial importance coffee is in the top 10 products most at risk of food fraud. Fraud takes a variety of forms:

- adulteration of coffee with cheaper materials such as coffee husks, chicory, cereal grains, woody tissue, cocoa or soya beans, acai berries or exogenous sugars
- substitution of the more expensive Arabica with cheaper beans.

Where should you start analytically checking the coffee supply chain?

This problem has been tackled by the Government Chemist's team at LGC and the Institute of Global Food Security in Queen's University Belfast. Distilling the results of a number of studies in scientific literature, Laura Tweed, Prof Duncan Thorburn Burns and Dr Michael Walker have produced key instructions for probing the authenticity of coffee.

Common adulterants

Most of the common adulterants can be detected by chromatography of marker carbohydrates as detailed in standard methods (BS ISO 24114 and BS 5752-15) with the help of chromatograms of authentic coffee/ adulterant mixtures. Looking at DNA with Real-Time PCR is a viable alternative to chemistry-based methods.

Geographic origin

Claims for specific coffee bean geographic origin can be checked by identification of discriminant molecular markers, although these are not as yet available for all coffee growing areas. A method using solvent extraction and Fourier Transform infrared spectroscopy, FTIR, has the advantage that the FTIR spectra for authentic dichloromethane extracts are freely available online.

Coffee bean species

Discrimination between Arabica and Robusta species in coffee samples is possible via the marker compounds kahweol and 16-0-cafestol, predominant in Robusta. Determination of the latter by nuclear magnetic resonance (NMR) spectroscopy has the advantage of speed and relative simplicity.

Kopi Luwak

The most intriguing coffee authenticity problem is posed by Kopi Luwak, coffee beans harvested from the faeces of the palm civet cat. The processing of the beans in the digestive tract of this cat indigenous to Indonesia contributes to Kopi Luwak's mystique and price. Although proof of identity of Kopi Luwak has been made more difficult by the possibility of mimicking the effect of the cat's gut on beans through the use of microorganisms and enzymes, discriminant markers identified by gas chromatography combined with mass spectrometry (GC-MS) has proved successful. The question as to whether or not any residual civet cat DNA can be detected on ground roast coffee can be detected remains unanswered.

The review

The [full paper](#) contains outline experimental details and references to the key studies so that any laboratory wishing to check coffee in the supply chain can make a good start.

Reference

Thorburn Burns D, Tweed L & Walker MJ. Ground Roast Coffee: Review of Analytical Strategies to Estimate Geographic Origin, Species Authenticity and Adulteration by Dilution (2017) Food Anal Methods.

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