Using every tool in the box to combat honey fraud

Adulterated honey is a major threat to the industry, which is why companies like Intertek are employing powerful testing capabilities to detect chemical modifications to combat honey launderers.

HONEY HAS ALWAYS been big business, but in recent years, demand for the product has seen a major increase. The size of the global market for this natural, energy-rich sweetener grew to $9.79 billion in 2019, and is expected to reach $14.43 billion by 2025.

However, the increasing popularity of honey only serves to further incentivise exploitation of the market with fake or adulterated products. According to the Honey Authenticity Project, honey is the third most-adulterated food in the world, with adulteration being found in as much as 33 percent of all honey products. With each passing year, these fraudulent products become more common and more difficult to detect, which is why a broad and innovative portfolio of quality analysis tools is needed.

The total quality assurance specialists at Intertek play a key role in these efforts, with more than 44,000 employees in 1,000 locations across more than 100 countries. Here, Ulrike Burmester, Senior Lab Supervisor for authenticity stable isotope and NMR food services at Intertek Food Services GmbH, based in Bremen, Germany, shares her insights into how new analytical tools are proving to be valuable arms in the fight against honey fraud. She also discusses the necessity for all available methods to work together harmoniously in this battle for safe and authentic products.

The Bremen lab

Intertek's Bremen team specialises in honey sample analysis, offering a complete testing spectrum, including microbiology analysis, pollen measurement and quality parameter tests for pesticides, antibiotics and authenticity.

The company works with clients at every stage of the honey supply chain, from local honey producers to large-scale buyers and retailers, helping them to validate product authenticity, purity and quality. In 2020, the Intertek team in Bremen received more than 70,000 samples for analysis, with a significant percentage specifically for LC-IRMS (liquid chromatography isotope ratio mass spectrometry) testing.

For these customers, Intertek's work is vital. In 2019, up to 16 percent of all honey samples assessed by the Bremen lab showed signs of adulteration, with some batches needing to be tested multiple times as they moved along the supply chain to provide absolute confidence in their quality.

The rising threat

Intertek has observed increasing adulteration rates in its analyses over the last few years. Not only is fraud becoming more common, but the methods employed are becoming more sophisticated and harder to detect.

The markers we use for adulteration testing can be removed during syrup processing; one method for this is with chromatography, meaning the tests we use for adulteration detection become less effective. The fraudsters adapt their syrup according to our analysers' methods, so we have a duty to stay one step ahead with the implementation of new tests and releasing new methods to pinpoint the adulteration.

The increasingly global nature of the honey market also poses challenges, as the scale and complexity of international supply chains provides greater opportunities for launderers to introduce adulterated products and conceal their origins.

Using different solutions for different problems

Detecting honey adulteration is a challenge, but my expert team at Intertek has a broad range of testing solutions available to address this.

Isotope ratio testing remains the key mainstay of our testing techniques, forming the basis of AOAC 998.12, the industry's only official standard for honey testing. This is used to determine the presence of illegally added C4 sugars (corn syrup or cane sugars) in honey by using elemental analysis-based IRMS (EA-IRMS) to compare the carbon isotopic value of whole honey with its internal protein. The process remains highly useful, as some of the samples analysed by Intertek contain C4 sugar content in the range of 20 to 30 percent.

However, for other samples, different approaches are needed. LC-IRMS has also been shown to be a highly sensitive method for detecting smaller amounts of C4 sugar, as well as C3 sugar taken from sources such as rice and beets. Additionally, this approach has demonstrated clearer and more granular insights into the ratio and origins of each ingredient, leading the EU Commission to endorse the "reliable and reproducible" qualities of this method in a May 2020 technical report.

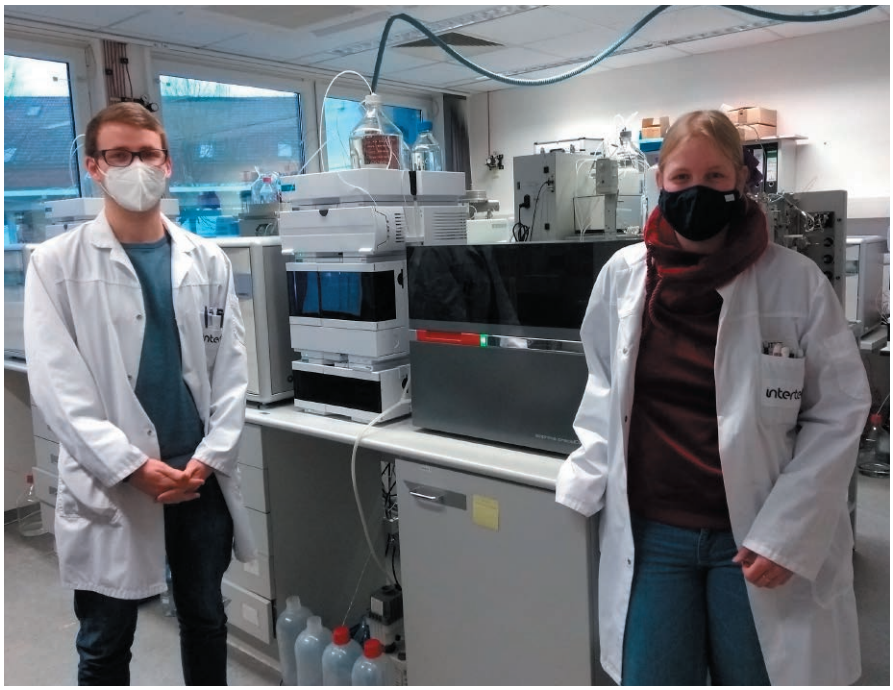
Elsewhere, we rely on NMR (nuclear magnetic resonance) profiling to compare the compositional fingerprint of each sample to a centralised reference database, as well as LC-HRMS (liquid chromatography high-resolution mass spectrometry) to deliver results with the highest level of sensitivity. This ensures that Intertek's lab in Bremen is well-equipped to assess the widest possible variety of samples.

New instruments offer new benefits

Alongside its existing range of tools, Intertek recently expanded its repertoire with the addition of Elementar's new iso CHROM® LC high-temperature combustion instrument for LC-IRMS testing, which is already delivering significant benefits.

Part of the BiovisION Honey testing platform, the iso CHROM system, uses high-temperature combustion to break down honey samples for analysis, rather than the widely used wet chemical oxidation process. Since adopting this technology, our workflow has transformed.

We have been using the iso CHROM LC over the last year and can confirm that the new technique is working robustly and reliably. The isotope ratios and sensitivity we observed are one-to-one comparable with LC-IRMS based on wet chemical oxidation, but without the need for harsh chemicals, such as sodium persulfate. Using these chemicals can lead to clogged capillaries, increased maintenance intervals, and wear on the LC pumps for the reagents.



In the lab at Intertek

The hardware is easy to maintain and provides automated test routines that can run overnight, allowing us to reduce downtime and get much closer to our goal of running tests 24/7.

The new iso CHROM platform has fitted seamlessly into Intertek's existing working methods, allowing us to deliver results that are consistent with our other instruments, while delivering greater efficiency.

Using every tool and avenue to fight honey fraud

However, we are keen to stress that there is no solution that can be relied upon as the sole weapon against honey adulteration. Instead, all methods must be used together, harnessing their complementary strengths to tackle the issue as broadly as possible.

New, more effective testing methods are always being developed, but honey fraudsters are constantly finding ways to evade detection by these means. No single method will ever be able to screen the complete spectrum, and consequently, the industry has a duty to continually adapt its approach to augment current capabilities.

The broader food industry and governments must share the responsibility for preventing honey fraud. We therefore call on them to pay close attention to current honey prices, transport rules, production numbers and import/export figures for honey, syrup, and raw materials across the worldwide market to uncover food fraud.

Clearly, the risk posed by honey adulteration remains significant, but with rising consumer demand for honey, there is also plenty of scope for the sector to grow.

By equipping ourselves with the broadest suite of analytical tools available – and allied with proactive action by regulators – the honey fraud problems can be kept under control, helping the honey industry take full advantage of the commercial opportunities available to them.

Ulrike Burmester

Ulrike is senior lab supervisor for authenticity stable isotope and NMR food services at Intertek Food Services GmbH. Ulrike manages Intertek's honey and syrup authenticity testing, ensuring a higher-quality product for consumers.