Honey Fraud – The Local Impact of a Global Problem

Setting the stage

“Honey is amongst the select group of nine foods with most reported cases of economically motivated adulteration, often considered the second or third most fraudulent product along with olive oil and fish.”

What is Adulteration?

"Economically motivated adulteration of honey includes cases of intentional dilution with syrups (corn, rice, beet, etc.), feeding hives during a nectar flow, use of antibiotics and other chemicals in honey bee populations in a way that results in residues in honey, and masking the true country of origin of honey to avoid tariffs and testing (Strayer, 2014). Adulteration could also include the widespread practice of extracting immature honey and then dehumidifying it by mechanical means."

Recent Canadian Experience

In 2018-19 the CFIA undertook a targeted surveillance strategy.

- Strategy began in June 2018 and was carried out over a 14 week period ending in September 2018.
- 240 samples were collected across Canada
- Samples included bulk honey intended for further processing and retail packaged honey intended for sale to consumers.
- Samples were taken from a variety of establishment types, including importers, brokers, distributors, blenders, graders, domestic processing facilities and retailers.

Testing

- CFIA conducted analyses using Stable Isotope Ratio Analysis (SIRA) to detect adulteration with sugar cane and corn syrups (C4 sugars). Nuclear Magnetic Resonance (NMR) analyses were conducted by a contract laboratory (Bruker) to detect added foreign sugars from these as well as other sources such as C3 sugars.

Testing Parameters

SIRA testing assessment is based on an internationally recognized Association of Official Analytical Chemists (AOAC) method and has a threshold limit for detection of adulteration of 7% calculated C4 sugars. The NMR testing assessment is based on the comparison of the sample to the profile of authentic honey, developed from the analysis of over 18,000 authentic honey samples and sugar syrups used for adulteration. SIRA testing reports the C4 sugar content of honey as a percentage while NMR only reports whether addition of foreign sugars has occurred. It is important to note that the sampling was targeted based on risk factors for non-compliance, as opposed to random sampling.

Results

-188 samples were satisfactory by both methods: 78.3% (188/240)

-52 samples were unsatisfactory by one or both methods: 21.7% (52/240)

- 16 samples were unsatisfactory for SIRA testing: 6.3% (16/240)
- 44 samples were unsatisfactory for NMR testing: 18.3% (44/240)
- **SIRA testing found 8 (out of 15) samples unsatisfactory that were not found by NMR**
- **NMR testing found 34 (out of 44) samples unsatisfactory that were not found by SIRA.**

Ramifications – What's Next

- Canada became the first country to have it's government use NMR to identify adulterated honey.
- It also set an expectation that it will continue to do testing, especially since such a high percentage of the honey was found to be fraudulent.
- It raised the bar for Canadian beekeepers.
- Last budget had money set aside for food fraud.

Next up in Canada – Apimondia – Honey Contest

…This year entrants in the honey categories have been subjected to external laboratory analysis using ISO 17025 accredited laboratories to test for honey purity, contamination with residues, and some traditional quality parameters.

The results of laboratory testing indicate to us that there is much work to do and many areas that we, as a global beekeeping community, can focus on for improvement. They also reflect an increasing pressure on beekeepers to maintain the health of their bees, which may in turn increase the risk of unintentional contamination of their products…. Beekeepers need good knowledge, education and support globally. The World Beekeeping Awards, the Apimondia Statement on Honey Adulteration, and this Congress are part of this ongoing process to improve beekeeping and bee products.

What happened?

RESULTS OF LABORATORY TESTS WBA 2019

		%
NUMBER OF SAMPLES OK	52	33.1
NUMBER OF SAMPLES OK?	34	21.6
NUMBER OF SAMPLES FAILED ANTIBIOTICS ONLY	10	6.4
NUMBER OF SAMPLES FAILED PHYSICOCHEM. ONLY	17	10.8
NUMBER OF SAMPLES FAILED PURITY ONLY	23	14.6
NUMBER OF SAMPLES FAILED PURITY + ANTIBIOTICS	14	8.9
NUMBER OF SAMPLES FAILED ANTIBIOTICS AND PHYSICOCHEM.	3	1.9
NUMBER OF SAMPLES FAILED PURITY AND PHYSICOCHEM	4	2.5
TOTAL NUMBER OF SAMPLES FAILED	71	45.2
TOTAL NUMBER OF SAMPLES	157	100.0

Apimondia

- Physiochem refers to those items that aren't antibiotics but would be outside the definition of honey such as high moisture content and low diastase. Those were the two that were mentioned but it could also include hydroxymethylfurfural (HMF) content. (Also free acids and electrical conductivity)
- Purity does deal with sugars and would deal more with the issue of adulteration. There are distinctions because they really represent two or three different problems and need to be addressed differently. Also the testing methods are different.

Evaluating the results

- Cloramphenicol – showed up as a major contaminent
- Tylosin and tetracycline also prevalent
- Low diastase and high moisture
- Added sugars and not from country of origin
- Many multiple infractions

Apimondia/Canada – What's next

- Revamp Apimondia Statement on Honey Fraud
- Improve the database in North America for NMR and use the technology
- Invest in new science opportunities like mass spectrometry
- Continue to engage the public
- Why is this important to Ontario?

Questions??

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Thank You!