

New Technologies and Business/University Collaborations in the Detection of Honey Fraud

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Six Forms of Adulteration

Addition of Sugar Syrups

Aliphatic Resin Scrub (“Resin Technology”)

Immature Honey Harvesting

Ultrafiltration

Overheating

Antibiotics and Pesticides

This is not an exhaustive list....

Sugar Syrups

Sources include:

Corn, Cane, Wheat, Beet, Rice

Created by chemically breaking apart multi-chain starches into the simple sugars fructose and glucose.

Inversion

Sugar Syrups

Analytical methods of Detection:

LC-EA-IRMS

Detects variations in Carbon-13 ratios between the different simple sugars

Sugar Syrups

Analytical methods of Detection:

NMR

Detects unnatural variances in multiple hydrogen signals as well as creating a sugar profile

**Part of a honey screening system developed by
Bruker BioSpin**

Sugar Syrups

Analytical methods of Detection:

LC-High Resolution MS

Analyzes for polysaccharides not reacted in the inversion reaction

Three major MS types:

Triple quadrupole (QQQ or 3Q)

Hybrid quadrupole ion trap (Hybrid)

Quadrupole Time-of-Flight (qTOF)

“Resin Technology”

The act of using an aliphatic resin to scrub unwanted materials from honey:

Malodors

Darkness

HMF

Introduced compounds (e.g., antibiotics)

“Resin Technology”

Performed by diluting honey, passing through the resin bed and dehydrating the resultant solution to sell as honey.

THIS IS A CHEMICAL ALTERATION OF HONEY!

Research at the University of Missouri in collaboration with Sweetwater has confirmed this can be detected by NMR

Immature Honey Harvest

Harvesting honey before it is capped, even to the point that there is 40%+ moisture (every 5-7 days).

The moisture is removed by forced evaporation

This affects the hive such that workers originally maintaining the hive mature unnaturally fast to become nectar foragers

Immature Honey Harvest

Harvesting honey before it is capped, even to the point that there is 40%+ moisture (every 5-7 days).
The moisture is removed by forced evaporation

Research at the University of Missouri in collaboration with Sweetwater has been finding evidence for this type of adulteration utilizing metabolomics

Ultrafiltration

Performed by diluting honey, pushing through a diatomaceous earth bed and dehydrating the resultant solution to sell as honey.

THIS IS A CHEMICAL ALTERATION OF HONEY!

This removes traces of pollen as well. One can then “dust” the honey with pollen from elsewhere to assist in transshipment to avoid import duties.

Hydrogen isotope ratios are different between tap water and water naturally occurring in nectars

Overheating

Honey packers are heating honeys to well over 50°C for over 36 hours prior to packing.

The excuse is to create “preferred” liquid honey.
The reality is that it melts sugar crystals in order to process more packages faster.

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Packers of Raw Honey are using this method.

These temperatures and times destroy enzymes and other biomolecules that are purported to be of health benefit.

Overheating

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Traditionally, 5-HMF concentrations are indicative of cooking honey.

Research at the University of Missouri in collaboration with Sweetwater are finding evidence for this type of adulteration utilizing NMR that is separate from HMF concentrations.



Antibiotics and Pesticides

Antibiotics are the mainstay of treating for American Foulbrood. However, they are not supposed to be used on honey-producing hives. In addition, most are not to be used on bees.

LC-HRMS can identify and quantify these compounds in rapid order.

Antibiotics and Pesticides

Pesticides (insecticides, herbicides, fungicides) are a perennial issue between farmers and beekeepers.

In addition, labelling honey as the higher quality “Organic” requires lack of any pesticides.

LC-HRMS can identify and quantify these compounds in rapid order.

Laboratory Analysis Methods are Not Static

In order to ensure continued accuracy, research collaborations between research universities and industrial analysis labs are essential



Production Integrity is Paramount

Producers and packers should be willing to have their hives and production facilities truly audited on a regular, random basis. Random samples taken from hives, extraction outlets, packers' facilities, and random shelf pulls must also be sent for analysis to promote product integrity.





Forensic Audits



Scientific Analysis



Product Authentication

