Photo: Analytica Laboratories.

TECHNICAL SUMMARY

Common and emerging tests for honey

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Whether you're buying or selling, you will need to have your honey tested by a laboratory to meet either an Overseas Market Requirement (OMAR) or the requirement of a prospective buyer. This article outlines some of these common and emerging tests.

The international standard for honey (CODEX) is widely referred to when checking the authenticity of the honey. Some of the tests you may be asked for that arise from this standard are C4 sugars, diastase and HMF.

Honey is typically tested at extraction, during storage, after blending and after packing.

MĀNUKA AUTHENTICITY

New Zealand's reputation for honey production and export rests on the integrity of the products that are produced. The following tests are commonly requested to provide proof that the mānuka honey is genuine and real.

Mānuka 3-in-1: The most common lab test for mānuka honey is 3-in-1, which is used for mānuka grading. This measures the concentration of three special compounds found in mānuka honey: DHA, MG and HMF. As the honey grows over time, DHA converts into MG and from that conversion you get the NPA (non-peroxide activity) of the honey.

3-in-1 results will also change over time, so a forecast can show how the change will likely happen if stored at certain temperatures and over certain time periods. A forecast can often be of just as much interest as the 3-in-1 results themselves.

Leptosperin: Leptosperin is a chemical marker unique to mānuka honey. Leptosperin is part of the UMF™ Grading system. UMF™ Honey Association members wishing to label their batch of honey with a UMF™ grade will need this test.

MPI5 Attributes (MPI Mānuka Markers + MPI Mānuka DNA): MPI initiated a three-year mānuka honey science programme in 2015, spurred on by international reports of mānuka honey adulteration and fraud. All five attributes need to pass MPI's definition for the honey to be labelled as monofloral mānuka, or multifloral mānuka for export.

The Mānuka Definition can be found on MPI's website: https://www.mpi.govt.nz/dmsdocument/17374-Mānuka-Honey-Science-Definition-infographic

QUALITY

The quality of the honey determines the ability to attract a premium price and to meet specific standards. The following tests provide information about the quality of the honey.

C4 Sugars: A C4 sugars test is used to detect the adulteration of honey by adding certain types of sugar (mainly cane sugar and high-fructose corn syrup).

A common practice is to feed sugar syrup to sustain a hive outside of the period when nectar is available for the bees to collect. If syrup feeding is not well timed, or if fed in excess, syrup can end up in the honey.

The common standard for C4 sugars is 7%, based on the international standard testing method AOAC 998.12.

Diastase: Diastase is an enzyme that is found naturally in honey and can be used to indicate the age and exposure of honey to heat. Testing for diastase is becoming a more common requirement in some countries including in Europe, Canada and the Middle East.

Diastase activity can drop off with (among other things):

- long-term storage
- excessive heating.

International regulations for certain countries have in place a limit of ≥ 7 DN (diastase number) for honey.

Nuclear Magnetic Resonance (NMR): NMR is a technique for assessing the quality of the honey that has had a lot of attention over the last 3–4 years. It applies a magnetic force to a sample, measures the result of this on the sample, and then predicts the profile of components present in the sample by comparing the results to a reference database.

Many things can be measured simultaneously:

- sugars
- floral type
- amino acids
- organic acids.

MORE ON NMR TESTING

NMR is gaining strong acceptance in Europe and China as a new technique for detecting sugar adulteration and

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the floral purity of honey. It is of most interest to people with mānuka honey showing what they believe to be a high 'false positive' level of C4 sugar based on the C4 sugars test. The detection of sugar adulteration is based on chemical signature patterns in the honey.

NMR can simultaneously test for a number of honey attributes that normally need multiple different tests. The FoodScreener™ NMR, made by the analytical instrumentation company Bruker, is able to:

- quantify quality components like sugars, DHA, MG and HMF, and fermentation products
- verify the geographic origin and botanical source of honey
- detect the addition of some sugar syrups.

Bruker has over 18,000 honey samples from around the world in its database. Many of the honeys of different origin and floral types are well represented, but not all. At this stage the number of Australasian honeys (and mānuka) included in the NMR database is limited, but over time more authentic samples will be added to the library to improve its accuracy.

When the FoodScreener™ is used to detect the addition of sugar syrups, multiple chemical markers and signature patterns are used instead of a library of honey samples. The instrument is able to detect C4 sugars, such as cane sugar and corn syrups, as well as C3 sugars, such as rice syrup. However, it can have difficulty detecting very pure forms of these sugars added to honey.

RESIDUES, TOXINS AND HIVE HEALTH

Glyphosate: Glyphosate is the active ingredient in Roundup® and is used widely throughout the agricultural sector.

Some countries have a maximum residue limit (MRL) in place for glyphosate, *current as of March 2022*:

- Japan: 0.05 mg/kg
- Europe: 0.05 mg/kg
- New Zealand: 0.1 mg/kg

American foulbrood (AFB): A DNA PCR-based method detects the presence of AFB spores in honey. This test can be used as a management tool to understand AFB risk within a beekeeping operation and can be useful for checking whether a honey conforms to Chinese import requirements.

To meet China's requirements, your honey will need a 'not detect' AFB result.

Amitraz: Amitraz is the active compound in Apivar®/Apitraz® strips used to kill varroa mites. Amitraz residues can end up in honey a number of ways, including when strips are overused in hives. Screening of batch samples representing hive sites will give information about the appropriateness of use of miticides at those sites, as well as identifying honey posing a residue risk to manufacturing operations.

Testing honey for amitraz and its metabolites may be of value to evaluate beekeeping practices and the use of Apivar® or Apitraz® strips in small- or large-scale beekeeping operations. It may also be valuable to test honey in inventory that may be used in export to countries where this MRL is enforced.

Pyrrolizidine alkaloids (PAs): Pyrrolizidine alkaloids are a naturally occurring toxin produced by some plants. These plants are widespread around the world, including parts of New Zealand.

When bees collect nectar and pollen from plants that produce PAs, the toxin can make its way into honey.

MORE ON PYRROLIZIDINE ALKALOIDS (PAs)

Research is ongoing into the potential risks and impact of PAs on the industry.

Some European countries have regulatory standards for PAs, so people exporting honey to Europe may be asked for test results showing PA concentrations in honey.

Some laboratories can test for PAs in honey, but the cost of testing, especially for a few samples, can be quite high due to the low demand. Testing in large bulk is likely to reduce the cost.

REFERENCES AND FURTHER READING

Codex Alimentarius Commission (2001). Revised Codex Standard for Honey, Codex STAN 12-1981, Revision 1 (1987); Revision 2 (2001).

Symes, W., & Lancaster, J. (2021, April/May) Pyrrolizidine alkaloids in honey: research, implications, and what you can do to reduce them. *The New Zealand BeeKeeper, 29*(3), 17–19.

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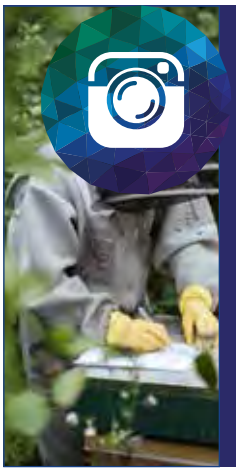

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