

## TECHNICAL SUMMARY

# WHEN IS HONEY REALLY HONEY?

Steve Howse, *Analytica Laboratories*

Honey is one of the most commonly adulterated foods in the world, and overseas countries or buyers often want confidence the honey being sold to them is authentic. The United Nations publishes an international standard for honey as part of its *Codex Alimentarius* (CODEX) range of standards, and this is widely referred to when checking for honey authenticity. Many of the tests that can be asked for in honey—including things like C4 Sugars, diastase, HMF, moisture, and conductivity—arise from this CODEX standard. This article gives an overview of what it contains, so you have a better idea of why you may be asked for such a range of honey test results.

Everyone loves honey! Well, maybe not everyone, but certainly it's a food that many people around the world enjoy eating. Unfortunately, honey is also among the most commonly adulterated foods traded in the world, and as a result there is a need for some standards that help to work out whether a 'honey' really is honey.

Each country develops its own way of doing this. However, in doing so many countries make reference to a food standard called *Codex Alimentarius* (CODEX), which is published by the FAO (part of the United Nations). A lot of New Zealand honey is exported, and becomes subject to the food standards of the country it is being exported to. Since CODEX is an important point of reference for many countries, it's worth understanding what it says about honey.

## The definition of honey in CODEX

CODEX defines honey as being a "natural sweet substance produced by honey bees" and allows for this to come from plant nectar (Blossom Honey or Nectar Honey) or from sugary secretions from plants or insects (Honeydew Honey).

Importantly, CODEX goes on to say that something sold as honey should only contain honey—with no additives, and nothing that was originally in the honey taken away from it. More specifically, honey cannot:

- have anything added to it other than honey; and
- have started to ferment; and
- have pollen or other components removed from it, unless as an unavoidable consequence of removing foreign matter from the honey; and



*Honey competition entries at the British National Honey Show, 2009. Photo supplied by Maureen (Maxwell) Conquer.*

- be heated or processed in a way that changes its original composition or quality; and
- have chemical treatments that are designed to affect honey crystallisation.

## Labelling of honey

CODEX goes on to provide a fairly detailed set of guidelines for how honey can be labelled. Among these are a couple of important principles:

- only honey that meets the CODEX definition (which has been summarised above) can be labelled as honey. Honey that has had things added to it, or taken away from it, should be regarded as a honey product and labelled in a way that makes this clear to a consumer
- if you want to identify a honey as coming from a particular floral source, it should come "wholly or mainly" from that source

and have the properties (colour, taste, smell, chemical composition, pollens, etc.) that would be expected for a honey from that source.

## Testing of honey

CODEX then describes some tests that can be used to confirm whether a honey meets the standard—and this is where a number of the tests which New Zealand beekeepers and processors are asked to carry out come from.

There are some tests (contained in Part 1 of CODEX) that are regarded as being 'Essential Composition And Quality Factors' and others (in the Annex) which are 'Additional Composition And Quality Factors'. As you will see from the list on the next page, tests from both sections are in regular use.

## Part 1: Essential Composition and Quality Factors

**Moisture content:** moisture is likely to be important both because high-moisture honey will be more prone to fermentation, and it can also indicate that the honey has been extracted before the bees have finished fully ripening it.

- New Zealand honeys should have < 20% moisture.

**Sugar content:** testing for sugars confirms that nectar and honeydew derived honeys contain the amounts of fructose and glucose that would be expected in them, and that there is no evidence of other sugar having been added to the honey (particularly sucrose from cane sugar). CODEX references an isotope ratio based testing method to detect added cane sugar—which is where the dreaded 'C4 Sugar Test' comes from.

- Nectar derived honey should have at least 60% fructose + glucose in them, and Honeydew derived honey should have at least 45%.
- New Zealand honeys should contain less than 5% sucrose (there are some varieties of honey that are allowed to have more sucrose, but these are not ones we produce in New Zealand).
- The honey should pass a C4 sugar test, like the one offered by New Zealand's main testing labs.

**Water insoluble solids:** there should not be a lot of solids in the honey that don't dissolve in water, like wax or bee parts, because people buying honey want to buy honey—not other random bits and pieces with it.

- New Zealand honeys should have no more than 0.1 g/100 g water insoluble solids.

**Contaminants:** heavy metals, pesticide residues, or antibiotic residues should not be present in honey at levels that represent a risk to human health. CODEX goes on to refer to a separate set of *Codex Alimentarius* residue limits, but in practice each country often has its own limits.

- The most common heavy metals tested in honey are lead (Pb) and zinc (Zn).
- Pesticide residue tests can range from large screens for hundreds of possible compounds, to specific ones considered to be a particular risk like miticides (flumethrin, fluvalinate, amitraz) or common agricultural chemicals (glyphosate).



Maureen Conquer (Chief Honey Judge), Dr Terry Braggins (Analytica Laboratories) and Claudine McCormick (Midlands Apiaries) judging the Manuka Honey Class at the ApiNZ Conference, Blenheim, July 2018. Photo supplied by Maureen Conquer.

- Antibiotics are of interest because in some countries they are used as a way of treating hives for diseases like AFB. While we don't do this in New Zealand, testing may still be requested.

**Hygiene:** while bees tend to be good at producing honey that is hygienic, management practices used by beekeepers and processors can introduce bugs into honey if they are not ideal.

- CODEX does not specify tests in the standard, but it is most common to see Aerobic Plate Count (APC) for bacteria, and Yeast & Mould Count being used for hygiene testing.

### Annex: Additional Composition and Quality Factors

**Free acidity:** honey will naturally have acidic compounds in it, but if it starts to ferment its acidity will increase due to build-up of things like acetic acid and other fermentation products. The CODEX definition of honey includes a requirement that it has not started to ferment, and testing for free acidity is a way of checking this.

- New Zealand honey should have free acidity < 50 meq/1000 g.

**Diastase and HMF:** these two tests identify whether honey has been exposed to excessive heat during storage and processing, or if the honey is getting old. Diastase is an enzyme added to honey by bees, which is highest at extraction and declines over time.

HMF (hydroxymethylfurfural) is a chemical found in honey which is low at extraction and increases with time. In countries asking for these tests to be done, a honey that fails to meet the required standard may only be regarded as suitable for use as a food

ingredient (e.g., for baking) rather than as a table honey.

- For New Zealand honey, diastase should be > 8 Schade units, and HMF concentration should be < 40 mg/kg.

**Electrical conductivity:** this test is used as a fairly crude check on whether a honey is a nectar derived honey, or a honeydew derived honey, as the electrical conductivity of honeydew is higher than most nectar honeys. There are exceptions, however (including *Leptospermum* honeys like mānuka).

- Most New Zealand nectar honeys should have conductivity < 0.8 mS/cm (800 μS/cm), but mānuka honey is considered an exception to this. Honeydew honeys should have conductivity > 0.8 mS/cm.

### Conclusion

With honey being such a popular food, CODEX attempts to define what can be labelled as 'honey' so that consumers can buy authentic products with confidence. While New Zealand honey is generally natural and produced by beekeepers and processors who have integrity, unfortunately it is then exported to countries where others do not always behave the same way. The growing range of tests that we are asked to do reflects this. By understanding CODEX, we get some insight into why we are being asked to provide results for things that we may not immediately understand as being important.

### Reference

*Codex Alimentarius* Standard 12-1982 for Honey. Retrieved from: [http://www.codexalimentarius.org/download/standards/310/cxs\\_012e.pdf](http://www.codexalimentarius.org/download/standards/310/cxs_012e.pdf).