

# Coordinated control plan to establish the prevalence of fraudulent practices in the marketing of honey

## Outline

**Objective:** assess the prevalence on the market of honeys adulterated with sugars and honeys mislabelled with regard to their botanical source or geographical origin.

**Sampling:** during official controls, the 28 Member States, Switzerland and Norway collected samples of honey intended for human consumption, originating in EU Member States or imported from third countries. The samples have been taken at different steps of the food chain.

**Timeframe:** samples have been collected from 1 June until 15 July 2015.

### **Control protocol:**

1) documentary and identity checks;

2) laboratory testing with the following methods:

- sensory test: allows to establish the sensory profile of the honey by evaluating attributes such as colour, odour, taste, touch and texture. It is an important instrument for quality control, especially to assess the conformity of monofloral honeys and to identify certain defects such as fermentation, impurities, off-odours and flavours. The sensory test may also raise suspicions of other non-compliances and orientate towards further more specific tests;
- microscopic analysis: pollen analysis determines the relative frequency of pollens and is usually effective to control the botanical source of honeys. It is also used for the identification of the geographical origin when a particular floral species is only growing in specific areas, or when certain pollen combinations are typical from the region in which the honey was produced. Moreover, microscopic analysis may provide important information about other quality aspects such as filtration, dilution, fermentation or contamination with mineral or organic particles;
- verification of two standardized physico-chemical criteria (electrical conductivity and diastase activity): these parameters are important markers of the quality and composition of honey and also of several types of adulterations;

- determination of sugar content (fructose, glucose, sucrose, turanose, maltose, melezitose, erlose, isomaltose, raffinose etc.) by gas chromatography (GC) or high-performance liquid chromatography (HPLC);
- Elemental Analyzer coupled with Isotope Ratio Mass Spectrometry (EA-IRMS): this validated method is based on the  $^{13}\text{C}/^{12}\text{C}$  carbon isotope ratio analysis and is able to detect, with a limit of detection of 7%, the presence of exogenous sugars derived from plants using the C4-photosynthetic cycle. These sugars, derived from cane, corn, millet or sorghum, have indeed isotopic  $^{13}\text{C}$  signatures different from sugars derived from most of the flowering plants from which bees collect nectar, that have a C3 carbon fixation pathway.

Samples characterized as non-compliant were those samples which did not meet the requirements of the documentary and identity checks or gave off-limit values for at least one laboratory test. Suspect of non-compliance were those samples which did not give off-limit values but whose results for the different analysis, taken individually or in combination, were considered to be unusual or questionable.

Suspect samples, together with a selection of samples that gave compliant results for all tests to which they were submitted, will be further investigated by Joint Research Centre – Institute for Reference Materials and Measurements of the European Commission (JRC-IRMM).

**Forthcoming further scientific investigations on sugar adulteration:** the available testing methods have strong limitations to detect adulterations with exogenous sugars derived from plants with a C3-photosynthetic cycle, such as beet, rice, cassava, wheat, chicory, agave, maple tree or many fruits. These sugars are more and more broadly used to adulterate honey.

JRC-IRMM has been mandated to further analyse, with advanced methods such as  $\delta^{13}\text{C}$ -EA/LC-IRMS and Nuclear magnetic resonance (NMR), 1200 samples that were not characterized as adulterated with the current tests.

On this basis JRC-IRMM will provide a cross-analysis of the full set of data and will assess the limitations of current testing methods to detect adulteration with sugars. It will also provide recommendations concerning the development of methods for official controls on honey authenticity. The report is expected by July 2016.

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## Overview of the testing protocol

