



Methods to detect honey adulteration – an update

Joint Research Center, Fraud Detection and Prevention Unit

Directive 2001/110/EC relating to honey

When placed on the market...honey shall not have

- added to it any food ingredient, including food additives, nor shall any other additions be made other than honey;
- pollen or constituents particular to honey be removed except ...

Composition criteria

Fructose and glucose content (sum of both)	Electrical conductivity
Sucrose content	Free acid
Moisture content	Diastase activity
Water-insoluble content	HMF

Methods of analysis

Article 4 of Directive 2001/110/EC

The Commission may adopt methods to permit verification of compliance of honey with the provisions of this Directive.

Until the adoption of such methods, Member States shall, whenever possible, use internationally recognised validated methods such as those approved by **Codex Alimentarius** to verify compliance with the provisions of this Directive.

Standard for honey CXS 12-1981 (revised 2019)

8. METHODS OF SAMPLING AND ANALYSIS

8.1 Sample preparation: AOAC 920.180

8.2 Moisture Content: AOAC 969.38B

8.3 Sugars Content (to be finalized)

8.3.1 Fructose and Glucose Content (sum of both)

8.3.2 Sucrose content

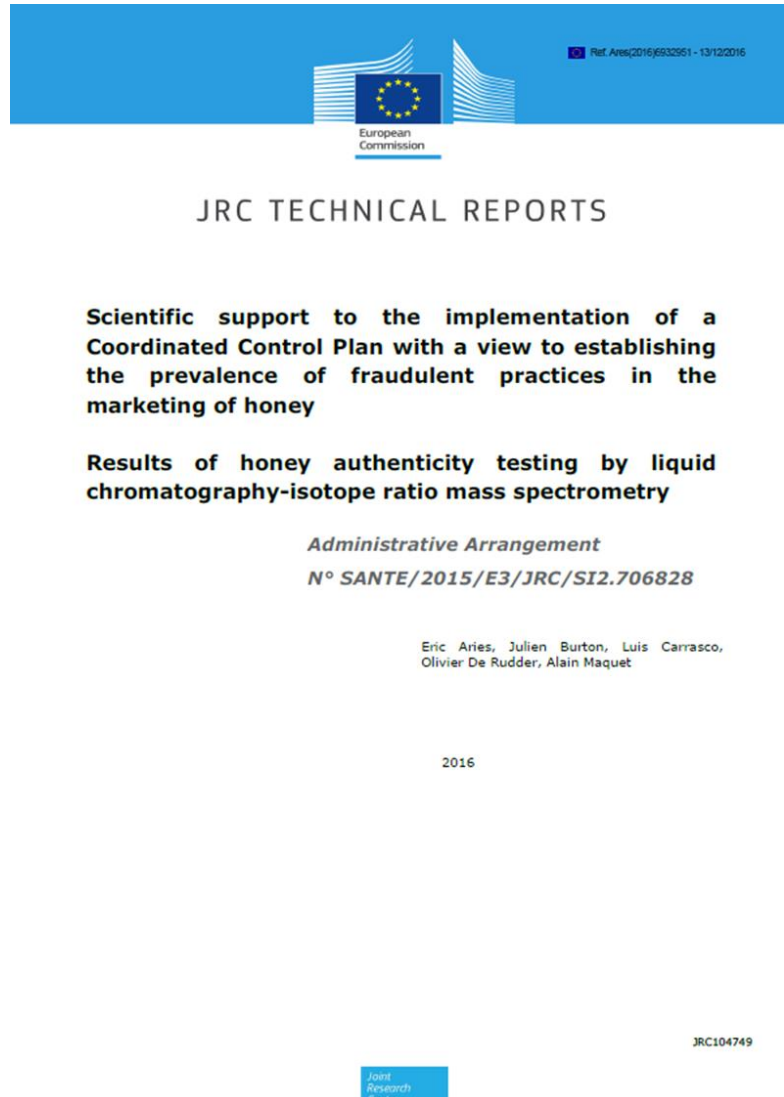
8.4 Water-insoluble solids: J. Assoc. Public Analysts (1992)

8.5 Electrical Conductivity

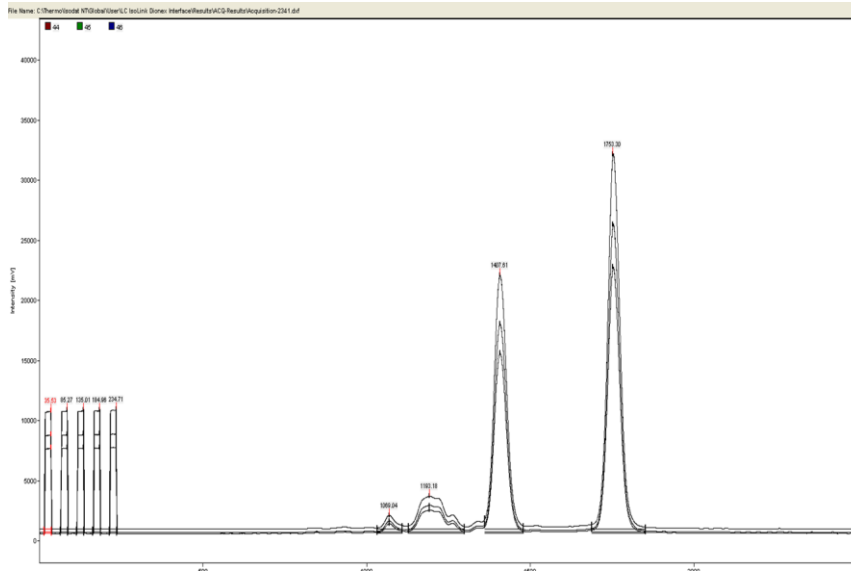
8.6 Sugars added to honey (authenticity) AOAC 977.20 for sugar profile, AOAC 991.41 for stable carbon isotope ratio analysis

Methods for additional composition and quality factors (Acidity, Diastase, HMF)

JRC activities related to honey



Ring-trial of LC-IRMS method

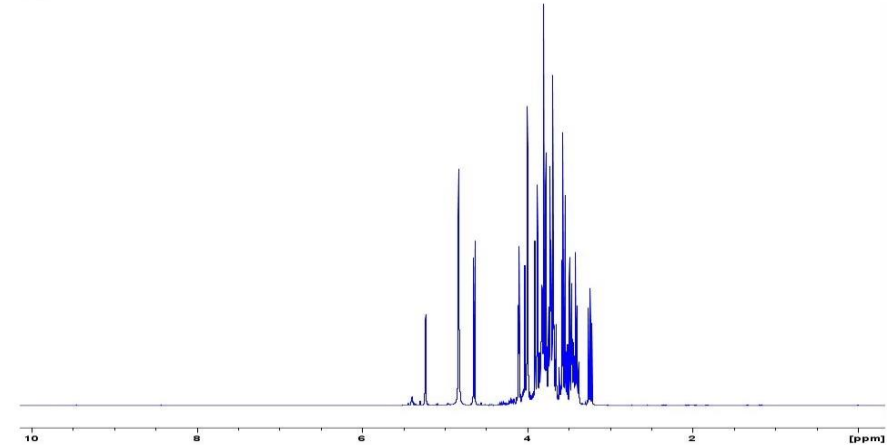


	Honey					
	HS-00045	HS-00048	HS-00329	HS-00378	HS-00959	HS-01158
Fructose						
Mean	-24.33	-25.07	-24.40	-24.26	-24.49	-26.41
Reproducibility standard deviation	0.38	0.28	0.19	0.27	0.38	0.37
Glucose						
Mean	-24.43	-24.47	-23.58	-23.71	-24.53	-26.03
Reproducibility standard deviation	0.31	0.43	0.34	0.33	0.29	0.42
Disaccharides						
Mean	-24.85	-26.27	-25.23	-25.13	-24.88	-27.01
Reproducibility standard deviation	0.35	0.34	0.36	0.24	0.36	0.31
Trisaccharides						
Mean	-24.05	-26.74	-24.69	-25.18	-22.73	-25.73
Reproducibility standard deviation	0.68	0.36	0.35	0.50	0.45	0.57

Oligo-polysaccharide profile by HPAE-PAD

- Quantification of main carbohydrates (Trehalose, Arabinose, Glucose, Fructose, Melibiose, Isomaltose, Maltulose, Sucrose, Gentiobiose, Turanose, Melezitose/Palatinose, Raffinose, Stachyose, Kestose, Maltose, Erllose, Panose, Nystose and Maltotriose).
- Quantification of maltodextrins from DP4 to DP10.
- Establishment of threshold levels for authentication of honey.
- Identification of adulteration based on ratios of sugars & presence of oligo- and polysaccharides.

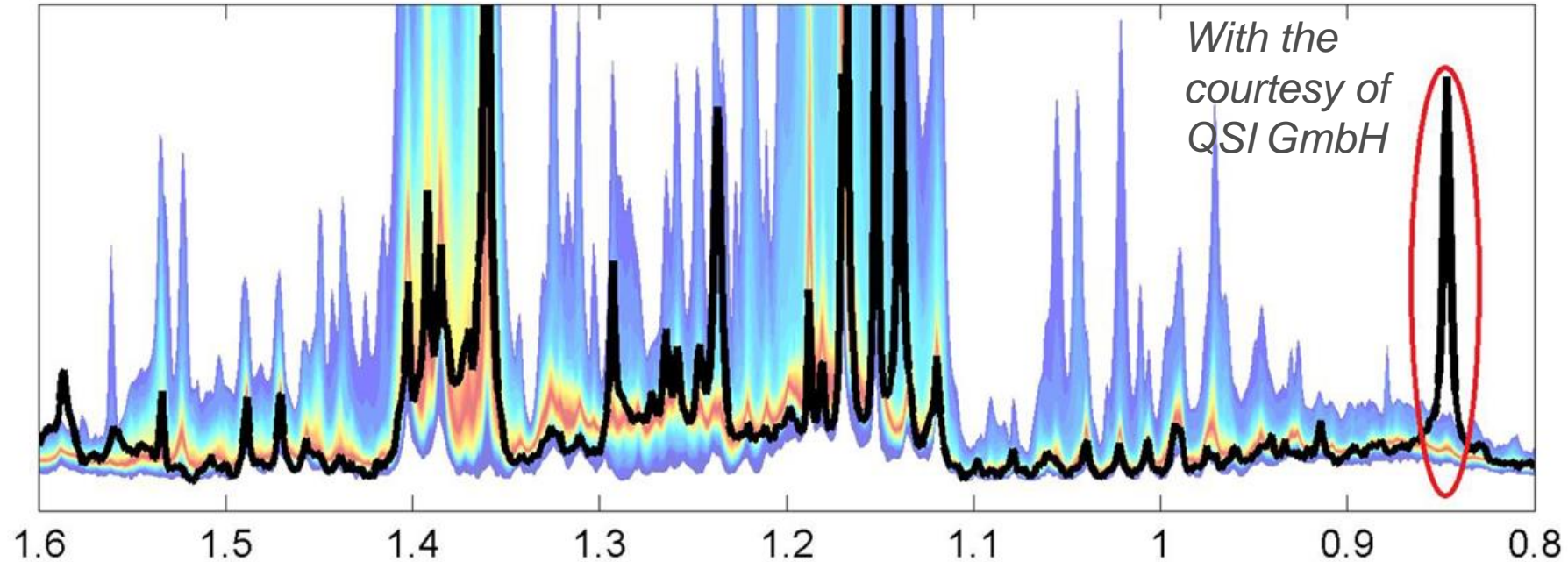
Profiling by Proton Nuclear Magnetic Resonance



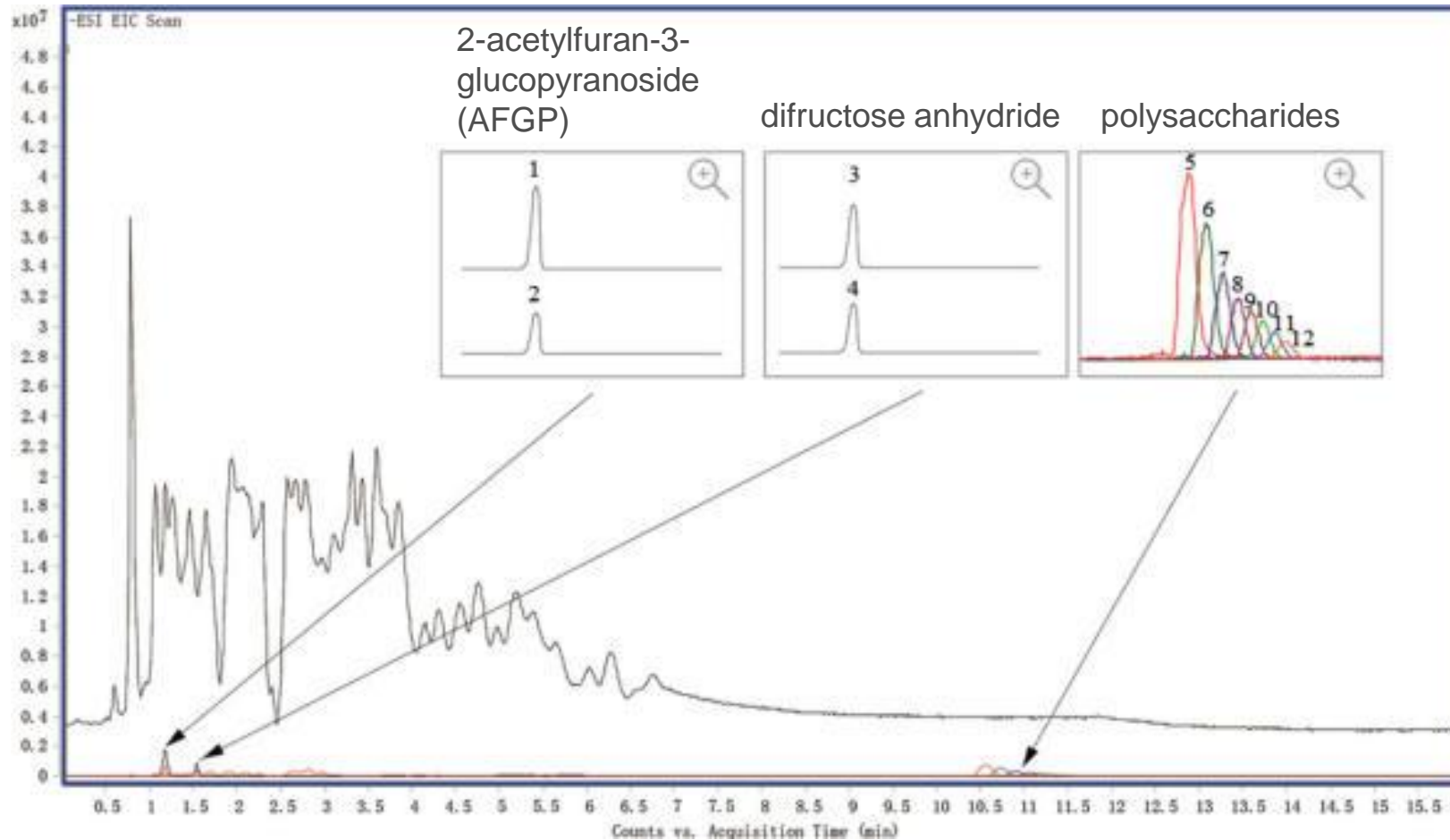
- **Comparison**
- **Evaluation**
- **Result**

Mixture of 47% Manuka honey with 53% Thyme honey

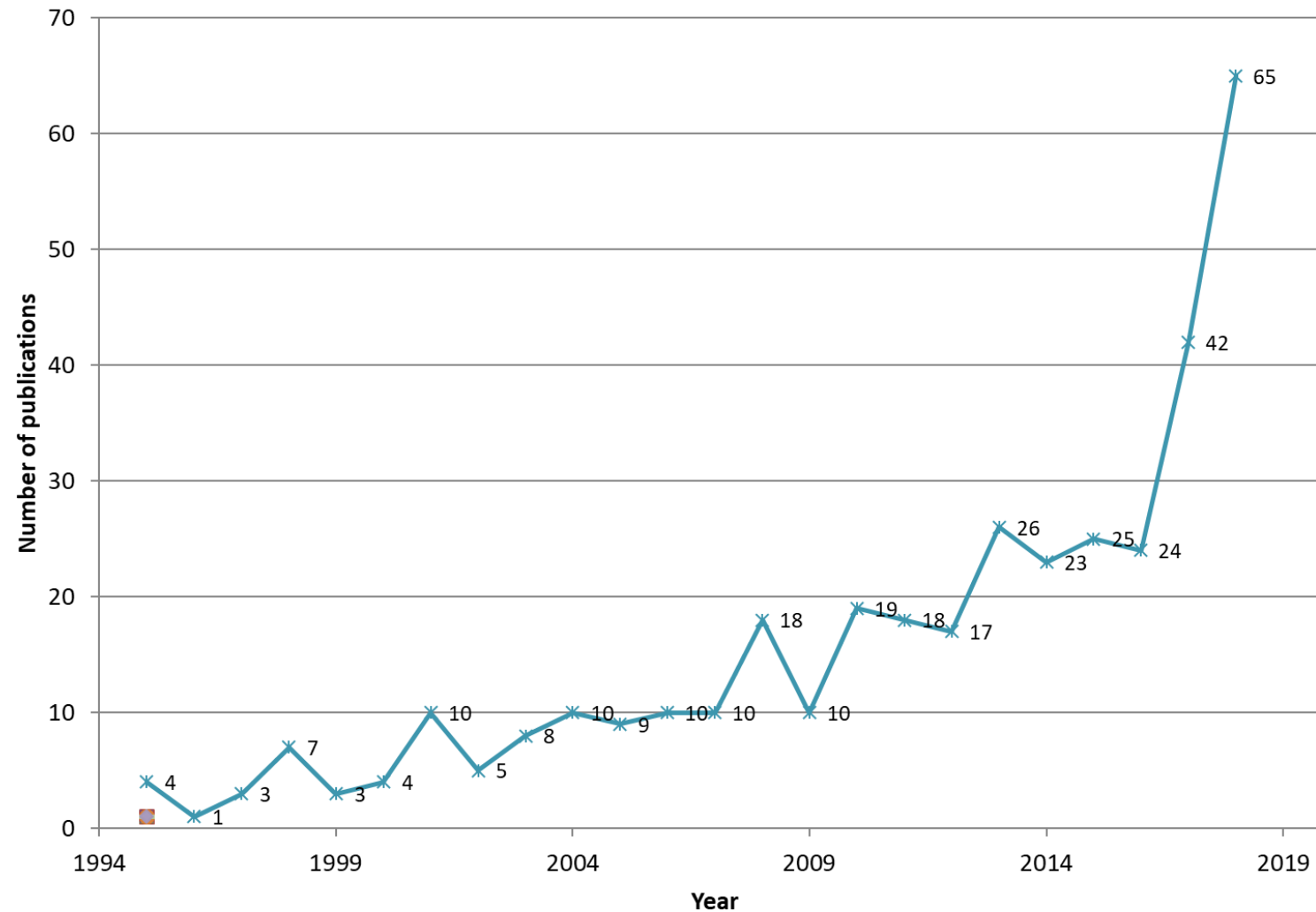
Exemplary quantil plot: NMR - Bruker Honey Profiling™



Markers by LC-MS



Bibliometric study (Scopus)



Rapid Screening of Multiclass Syrup Adulterants in Honey by Ultrahigh-Performance Liquid Chromatography/Quadrupole Time of Flight MS

Bing Du,^{†,‡}



Contents lists available at [ScienceDirect](#)

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem



Food Control 106 (2019) 106753

Fast and global

Marc Spiteri^a, Eric Douglas N. Rutledge[‡]



Contents lists available at [ScienceDirect](#)

Food Control

journal

Trends in Analytical Chemistry 86 (2017) 25–38



A novel methodology for real-time detection of adulteration of honey by rapeseed oil

Huijun Wang^a, Xueli Cao^{a,*}, Tian H



Contents lists available at [ScienceDirect](#)

Trends in Analytical Chemistry

journal homepage: www.elsevier.com/locate/trac



Recent advancements in detecting sugar-based adulterants in honey – A challenge

Liming Wu^{a, b, c}, Bing Du^a, Yan Vander Heyden^d, Lanzhen Chen^{a, b, c}, Liuwei Zhao^a, Miao Wang^{a, b, c}, Xiaofeng Xue^{a, b, c, *}

