



Analisi Chimiche Ricerche e Controlli di Qualità dal 1979

Headquarter: Via Lime, 4 ROCCA DE' BALDI CN Tel. +39(0)174-588003 Web: <http://www.floramo.net> Email: [info@floramo.com](mailto:info@floramo.com)

USA Office: 2990 Ponce de León #202, Miami FL 33134 US Tel. 305.529.5790 Email: [floramo.USA@floramo.net](mailto:floramo.USA@floramo.net)

## **IHC Meeting 2019**

May 7-10, 2019, Sliema – Malta

Workshop D: WG Authenticity of Bee Products (Chair: L. Elflein)

# **LC-HRMS applied on the honey authenticity (HRMS: High Resolution Mass Spectrometry)**



**Dr. Giancarlo Quaglia**

***Floramo Corporation - A Smart Choice in Honey Analysis !***

# The History of the Lab



Floramolabs is a family owned company founded by in 1979 in Piedmont, Italy.



**Italy Headquarter: 20,000 sqft lab**

**USA Office in Miami, Florida**

**France Office: Nice**

**Lab Open soon in Virginia USA**

**Listed Lab on the US National Honey Board**

**Lab Accredited on ISO 17025**

HRMS Specialist  
For residues and  
Authenticity  
Analysis of Honey

IRMS Dept.  
For Honey  
Adulteration Analysis

Dr. Giancarlo Quaglia: IHC Member - Authenticity Group  
Italian Expert appointed by UNI to ISO WG13 TC 34 on  
Royal Jelly and now for Honey Standard  
Coordinator of FEEDM Technical Group (European Honey  
Packers and Dealers Association)



# COUNCIL DIRECTIVE 2001/110/EC Annex 2: Composition Criteria consequence in EU and worldwide consequence:

Many test to define purity set by lab to solve the  
issue of added sugar or any other ingredient admitted  
at any level of concentration



## Mono and poly-saccharides usually added to honey for adulteration:

- glucose, fructose
- sucrose and inverted syrup (from cane, beet, etc.)
- starch syrup
- corn syrup
- high fructose corn syrup
- high fructose wheat syrup
- rice syrup
- others

?



## **HRMS in Honey Authenticity Topics:**

**Our lab developed the HRMS method by:**

**UPLC-HRMS for**

**Honey Authenticity Discovering**

**(C3/C4 foreign sugar syrup type)**

**Start to set the method in 2016**

**ISO 17025 Accredited Since 2018**

Dr. Giancarlo Quaglia - **Floram Corporation Italy**  
***A Smart Choice in Honey Analysis !***

## State of the HRMS on adulteration analysis in Floramo at May 2019

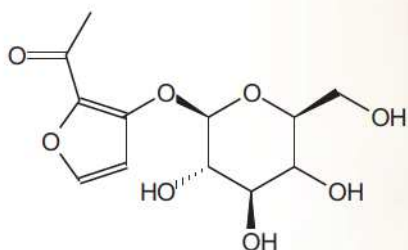
- **LC-HRMS: used in Floramo over two years, study started in 2016, today Routinely used**
- **LC-HRMS: at today more of 200 different sugar type analyzed: many Syrup Markers Discovered**
- **LC-HRMS: update syrup marker continuously when new sugar syrup analyzed**
- **LC-HRMS: retrospective analysis possible**
- **LC-HRMS: Reliable Methods: Accredited on ISO 17025 basis Since 2018 for Oligo DP12-DP19**
- **LC-HRMS: add the DFSA difructose anhydride and AFGP (2-acetylfuran-3-glucopyranoside)**
  
- ***EU Official Reference Lab JRC Joint Research Center work on HRMS***

## Summary of HRMS method

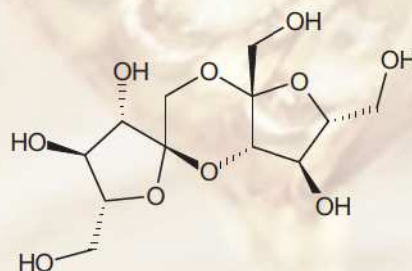
The identification of adulteration by sugars addition can be based on:

- 1) Studies on the composition of honey by HRMS: full mass scan at Resolution of 70000;
- 2) Identification of different syrup markers

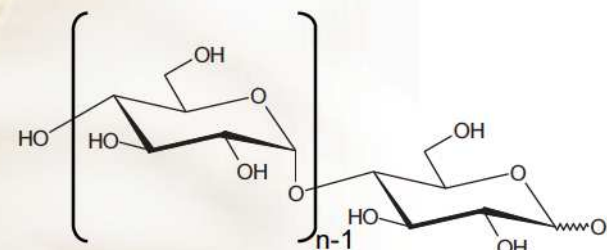
### Chemical structures of some markers



**2-acetylfuran-3-glucopyranoside  
(AFGP)**



**difructose anhydride III  
(DFA III)**



**polysaccharides  
(DP 12-19)  
(n:12-19)**



## Focus on Oligosaccharides DP12-19:

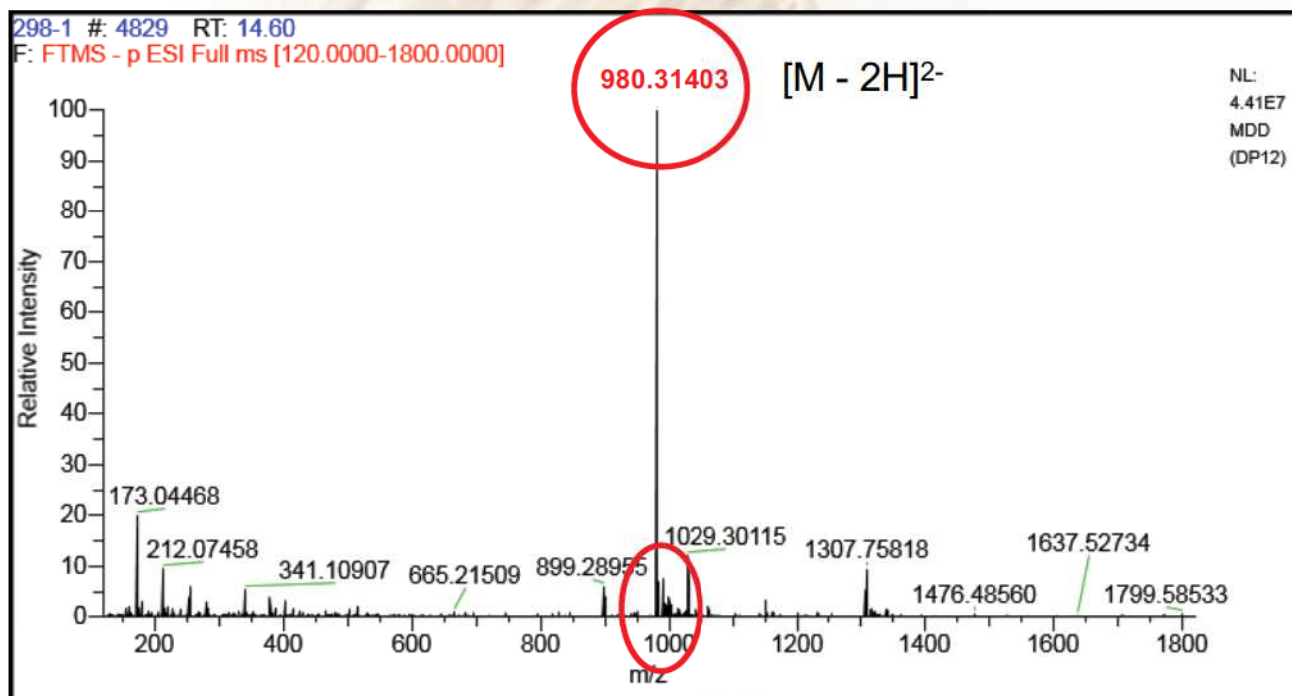
Focus to the identification of polysaccharides DP 12-19 in honey, as possible markers of sugar syrup addition, identifying the exact mass of ion and its isotopical pattern distribution.

We focus the attention to the identification of polysaccharides DP 12-19 in honey, as possible markers of sugar syrup addition identifying the exact mass of ion



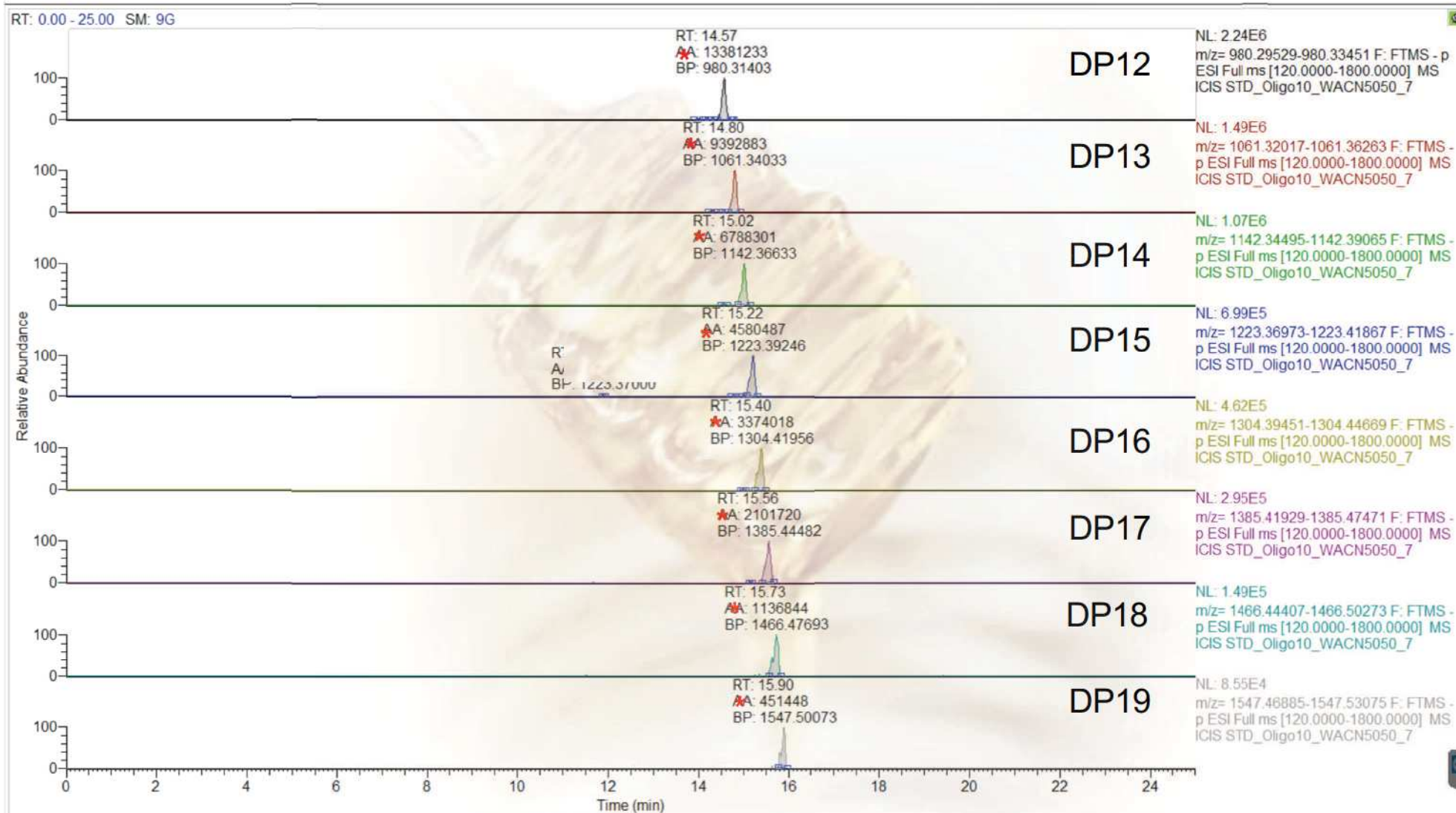
The confirmatory power of HRMS for identification of polysaccharides DP 12-19 or other syrup marker help the LC-IRMS or NMR measures or other analytical techniques to confirm the honey authenticity.

## Example of high resolution mass spectrum of DP 12 (Resolution 70.000)



# Exact Mass Ion $[M - 2H]^{2-}$ of DP 12 – 19 polysaccharides markers

\* exact mass value



Standard Sigma Aldrich of DP 12-19 polysaccharides at 10 ppm

Dr. Giancarlo Quaglia - Floramo Corporation Italy

A Smart Choice in Honey Analysis !



# blossom honey x: LC-HRMS evidences markers DP 12-19 from sugar syrup

## DP 12-19





### Example of calibration linearity and Response in Mix Type Honey (Range DP 12 – DP 19)

