AUTHENTICITY OF CYPRIO T HONEY USING SNIF-NMR AND CHEMOMETRICS: Preliminary results


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1. INTRODUCTION

PURE HONEY:
No addition of:
- Water
- Sweet substances (sugar, syrups)
- Feeding sugar and syrups to bees
- Artificial honey

AUTHENTIC HONEY:
- Pure honey
- No misdescription of botanical source
- No misdescription of topological source
- No misdescription of geographical origin

2. METHODS FOR HONEY AUTHENTICITY TESTING

- Titration, Refractometry, Gravimetry, Conductimetry, Potenciometry: determination of reducing sugars, moisture, water insoluble solids, ash, electrical conductivity, acidity
- Colorimetry: determination of diastase, HMF
- HPLC: determination of HMF, oligosacharides, sugars
- GC: determination of sugars
- GC-MS: determination of flavour components
- Enzymic: determination of sugar profile
- ICP-MS: determination of trace elements
- Capillary electrophoresis: determination of botanical source
- DNA profiling: determination of botanical source
- NIR, FTIR: product fingerprinting for adulteration
- Microscopy: pollen analysis
- 13C-IRMS: determination of sweet substances
- NMR: determination of sugars, flavours
- SNIF-NMR: determination of deuterium content

3. RESEARCH PROJECT

“MELISSA”

Specific target: To evaluate the ability of SNIF-NMR spectroscopy to differentiate the authentic Cypriot honey from: imported honey wrongly labelled as Cypriot, or samples made-up of mixtures of Cypriot and imported product

Scientifically support the authenticity of the product with unique characteristics and the producers.

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4. MATERIALS and METHODS

SAMPLING:
- Cypriot authentic: 100
- Greek commercial: 24
- European commercial: 32
- Others (from 3rd countries): 13
- Cypriot commercial: 44 (test)

FERMENTATION: Sugars + yeast (~22 C,7-8 days)
DISTILLATION: Ethanol (ADCS, Eurofins)
SNIF-NMR: Determination of (D/H)I, (D/H)II, R (Bruker, 400MHz)

Same laboratory conditions for all samples

5. ISOTOPE VALUES (mean, max-min)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Bee</th>
<th>(D/H)I</th>
<th>(D/H)II</th>
<th>R</th>
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<tbody>
<tr>
<td>CYPRIOT authentic</td>
<td>82.6</td>
<td>100.28</td>
<td>132.84</td>
<td>2.654</td>
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<td>(80.84-84.9)</td>
<td>(92.69-105.3)</td>
<td>(130.23-135.37)</td>
<td>(2.511-2.891)</td>
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<td>CYPRIOT commercial</td>
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<td>98.01</td>
<td>132.75</td>
<td>2.711</td>
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<td>(80.5-84.9)</td>
<td>(93.27-104.67)</td>
<td>(129.96-136.02)</td>
<td>(2.534-2.832)</td>
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<td>GREEK commercial</td>
<td>83.1</td>
<td>95.40</td>
<td>132.75</td>
<td>2.783</td>
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<td>(82.2-84.1)</td>
<td>(93.84-96.81)</td>
<td>(130.77-135.54)</td>
<td>(2.751-2.885)</td>
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<td>EUROPEAN commercial</td>
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<td>95.40</td>
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<td>(78.6-83.4)</td>
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<td>(2.524-2.925)</td>
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<td>94.50</td>
<td>132.26</td>
<td>2.799</td>
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<td>(79.9-85.0)</td>
<td>(92.32-98.010)</td>
<td>(131.10-133.30)</td>
<td>(2.713-2.840)</td>
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</tbody>
</table>

6. CLASS ASSIGNMENT PLOT

7. PCA DISTRIBUTION

8. CONCLUSIONS

- SNIF-NMR combined with chemometrics allows correct classification for authentic Cypriot honey.
- Classification in 2 categories: Cypriot and non-Cypriot honeys
- Cypriot commercial honeys: unclassified
- Total correct classification: 80.5%
- Detection limit for adulteration by mixing Cypriot and other honey: still under investigation

Need for establishing a European Isotopic Database of authentic honeys.

9. ACKNOWLEDGMENTS

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10. BIBLIOGRAPHY


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