XVII Encontro Nacional Química dos Alimentos

LIVRO DE RESUMOS

9-11 de outubro 2024

Vila Real, Portugal

SOCIEDADE PORTUGUESA DE QUÍMICA

utad UNIVERSIDADE DE TRÁS-OS-MONTES E ALTO DOURO

ÍNDICE

Comparison of FT-Raman and FT-NIR spectroscopy for distinguishing between two honey PDOs

Soraia I. Pedro,[1] Ana Ferreira,[2] Gonçalo Catarro,[3] Eugenia Gallardo,[2] Fátima Peres,[4] Ofélia Anjos[1,3,4]

[1]*CERNAS/IPCB - Centro de Investigação em Recursos Naturais, Ambiente e Sociedade, Instituto Politécnico de Castelo Branco, 6001-909 Castelo Branco, Portugal; soraia.pedro@ipcb.pt; ofelia@ipcb.pt*

[2]*Centro de Investigação em Ciências da Saúde - Universidade da Beira Interior, 6201-001 Covilhã, Portugal; carol.sf2000@gmail.com; egallardo@fcsaude.ubi.pt*

[3]*CBPBI - Centro de Biotecnologia de Plantas da Beira Interior, 6001-909 Castelo Branco, Portugal (goncalo.catarro@hotmail.com*

[4] *IPCB - Instituto Politécnico de Castelo Branco, 6000-909 Castelo Branco, Portugal; fperes@ipcb.pt*

Vibrational spectroscopy has demonstrated high applicability for honey analysis, offering rapid, non-destructive and accurate methods for assessing its chemical composition, identifying different honey regions and ensuring authenticity. In this study, we compare the usefulness of FT-Raman and FT-NIR spectroscopy techniques in distinguishing between two Protected Designation of Origin (PDO) of honey, namely "Terra Quente" and "Ribatejo Norte." The analyzed parameters of honey quality, determined according to the standard methods of the International Honey Commission including acidity, pH, moisture, water activity (a_w), electrical conductivity (EC), total polyphenols (TPC), total flavonoid content (TFC), and CIELAB color (L*, a*, b*), as well as the color in PFUND scale. The values observed for the analytical parameters are all in accordance with legal limits.

Regarding the analytical parameters, the principal component analysis shows that differences between the two PDO regions account for 25% of the total variance. The most relevant parameters for this distinction are TFC, EC and moisture, with all samples remaining within legal limits. According to Classification Trees analysis, there are also variations within each PDO, with the main analytical parameters for distinction being moisture, color parameter a*, PFund color and TPC.

Our findings indicate that FT-Raman spectroscopy provides better results in differentiating between the two PDOs (**Figure 1**). In fact, the Raman technique demonstrated higher sensitivity and specificity in detecting subtle differences in the chemical composition and physical properties of the honey samples. However, FT-NIR could be also useful to distinguish region inside each PDO, which resulted in higher variability and more overlap between samples (**Figure 2**). Although, FT-NIR spectroscopy showed some degree of discrimination, it was less effective when compared to FT-RAMAN.

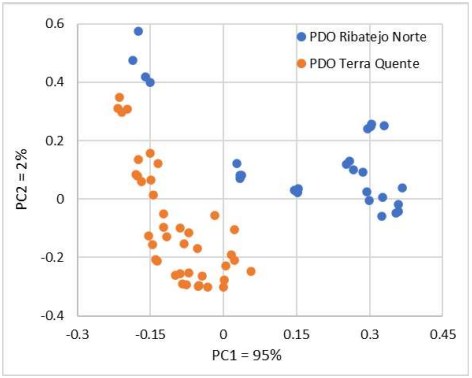

Figure 1: Principal components analysis of honeys from the two PDO regions performed with the spectral data acquired with FT-RAMAN

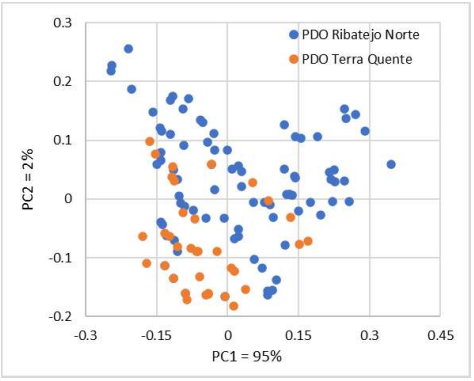

Figure 2: Principal components analysis of honeys from the two PDO regions performed with the spectral data acquired with FT-NIR

In conclusion, parameters such as TPC, TFC, color parameters and the PFund scale were effective in distinguishing between PDOs and regions within a PDO. The other parameters could be established as specific to each PDO characterization. This study highlights the potential of FT-Raman spectroscopy as a robust tool for honey quality control and PDO authentication, offering greater precision than NIR spectroscopy. These initial results from the BeeLand project will be validated with additional data and more PDO regions

Acknowledgements: We wish to express our gratitude to Bruno Ricardo from the PDO "Terra Quente" and to Anabela Mendes from the PDO "Ribatejo Norte" for their support in sampling.

Funding: NextGenerationEU recovery funds, through the Project BeeLand PRR-C05-i03-I-000081.

This work was also supported by Foundation for Science and Technology (FCT, Portugal) for their financial support through national funds FCT/MCTES (PIDDAC) to CERNAS-IPCB, UIDB/00681/2020 (DOI: 10.54499/UIDP/00681/2020) and CICS-UBI (https://doi.org/10.54499/UIDB/00709/2020 and https://doi.org/10.54499/UIDP/00709/2020).

XVII Encontro Nacional Química dos Alimentos

Sociedade Portuguesa de Química

utad Universidade de Trás-os-Montes e Alto Douro