

Potential of Cyclic Voltammetry Fingerprinting using Screen-Printed Electrodes to assess Spanish Honey Botanical Varieties

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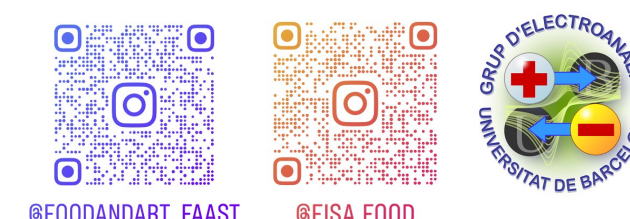
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INTRODUCTION & AIM

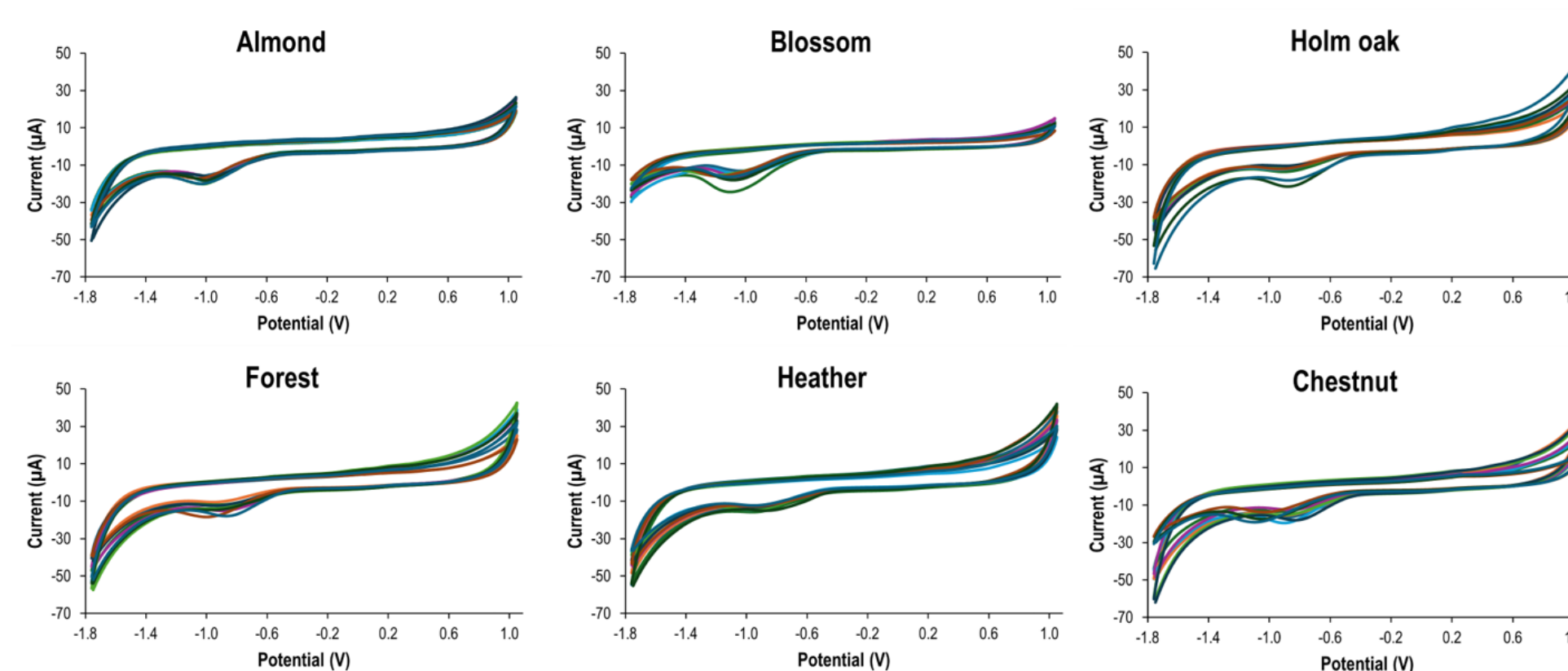
Honey is a natural product highly appreciated for its nutritional and therapeutic properties, but very susceptible to fraudulent practices. The high economic value and the complex composition make honey an attractive product for fraud, e. g., the addition of adulterants, the artificial feeding of the bees or the incorrect labelling of the botanical variety and the geographical origin. In this context, there is a need for simple, fast and reliable analytical methods for honey characterization and authentication.

The aim of the present contribution is to evaluate the potential of a non-targeted cyclic voltammetry (CV) fingerprinting method using screen-printed (SPCE) electrodes and chemometrics to discriminate Spanish honey samples according to its principal typology (blossom or honeydew honey) and its specific botanical variety. One hundred and ten blossom and honeydew honey samples of different botanical varieties (blossom, eucalyptus, heather, lavender, rosemary, thyme, almond, chestnut, forest, holm oak, and mountain) were analyzed after a simple dissolution of 2 g of honey in 20 mL of water.

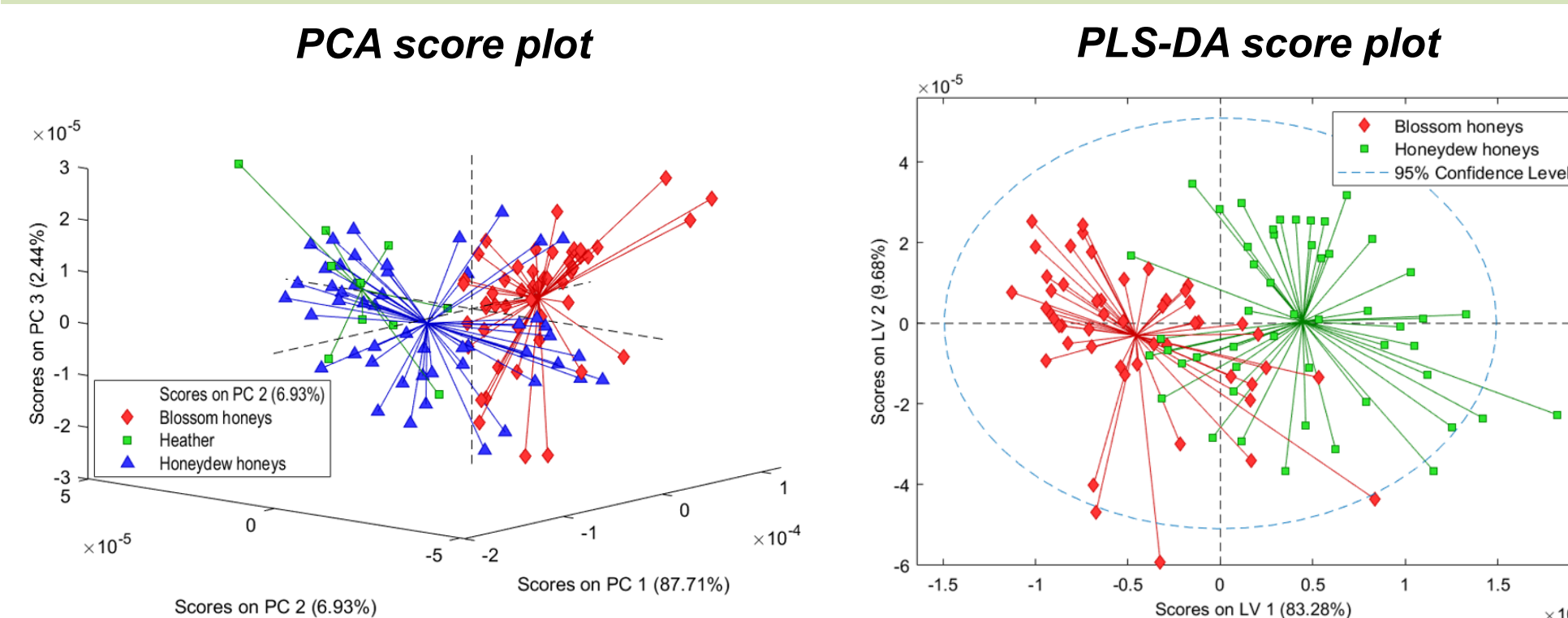
The obtained voltammetric fingerprints were selected as sample chemical descriptor for chemometric analysis by exploratory principal component analysis (PCA) and classificatory partial least squares-discriminant analysis (PLS-DA).

RESULTS & DISCUSSION

CYCLIC VOLTAMMOGRAMS OF SOME HONEY BOTANICAL VARIETIES

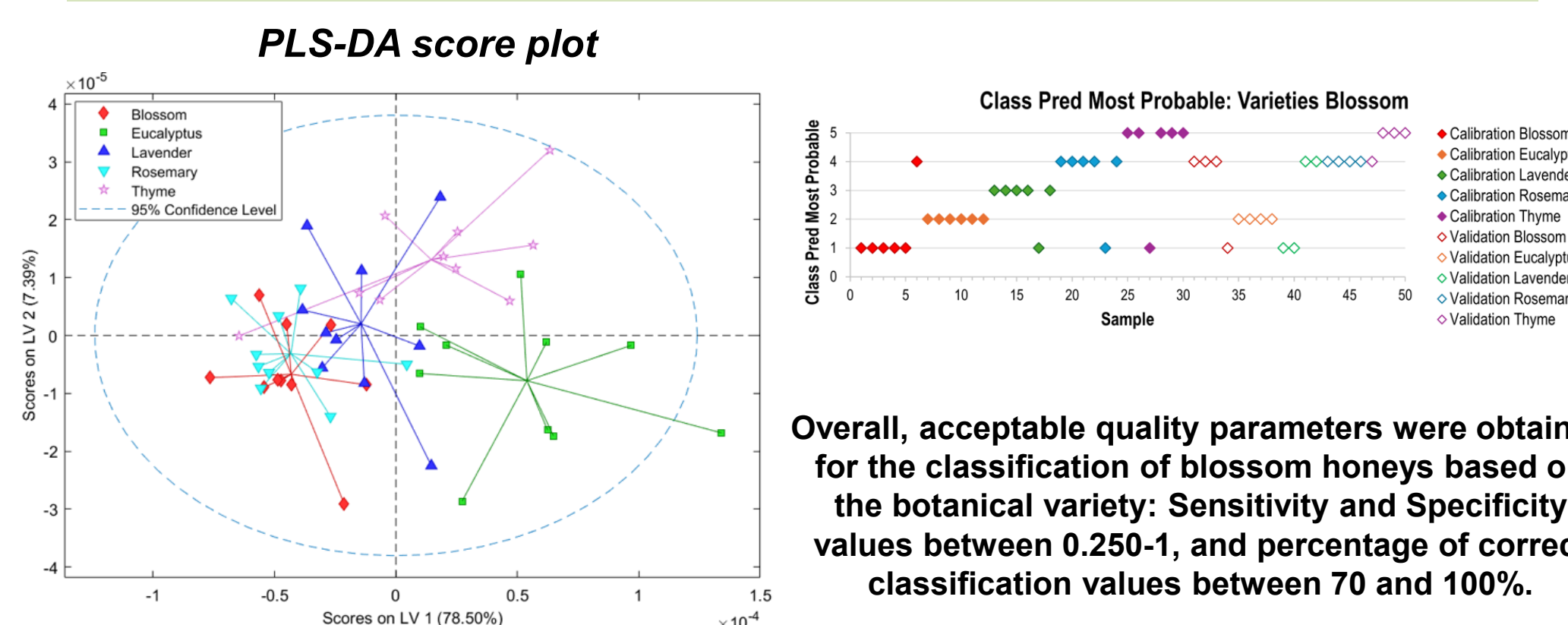


CLASSIFICATION OF HONEY BY MAIN BOTANICAL CATEGORIES



Good classification and discrimination among blossom and honeydew honeys was accomplished. Heather honeys, although being blossom honeys, are characterized to have physicochemical properties similar to those of honeydew honeys.

CLASSIFICATION OF BLOSSOM HONEYS BY BOTANICAL VARIETIES



Overall, acceptable quality parameters were obtained for the classification of blossom honeys based on the botanical variety: Sensitivity and Specificity values between 0.250-1, and percentage of correct classification values between 70 and 100%.

CONCLUSION

Exploratory PCA showed a clear discrimination among blossom and honeydew honey samples, with the exception of blossom heather samples that were grouped with the honeydew ones because of their similar physicochemical properties. PLSA-DA provided, in general, calibration and cross-validation sensitivity and specificity values higher than 0.9, and percentages of correct classification (PCC) ranging 80-92%. Good results were also achieved when addressing blossom and honeydew groups independently, with PCC values ranging 70-100% and 73-93% for blossom and honeydew varieties, respectively, demonstrating the suitability of non-targeted cyclic voltammetry fingerprints as sample chemical descriptors to assess honey botanical variety classification and discrimination.

ACKNOWLEDGEMENTS



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METHOD

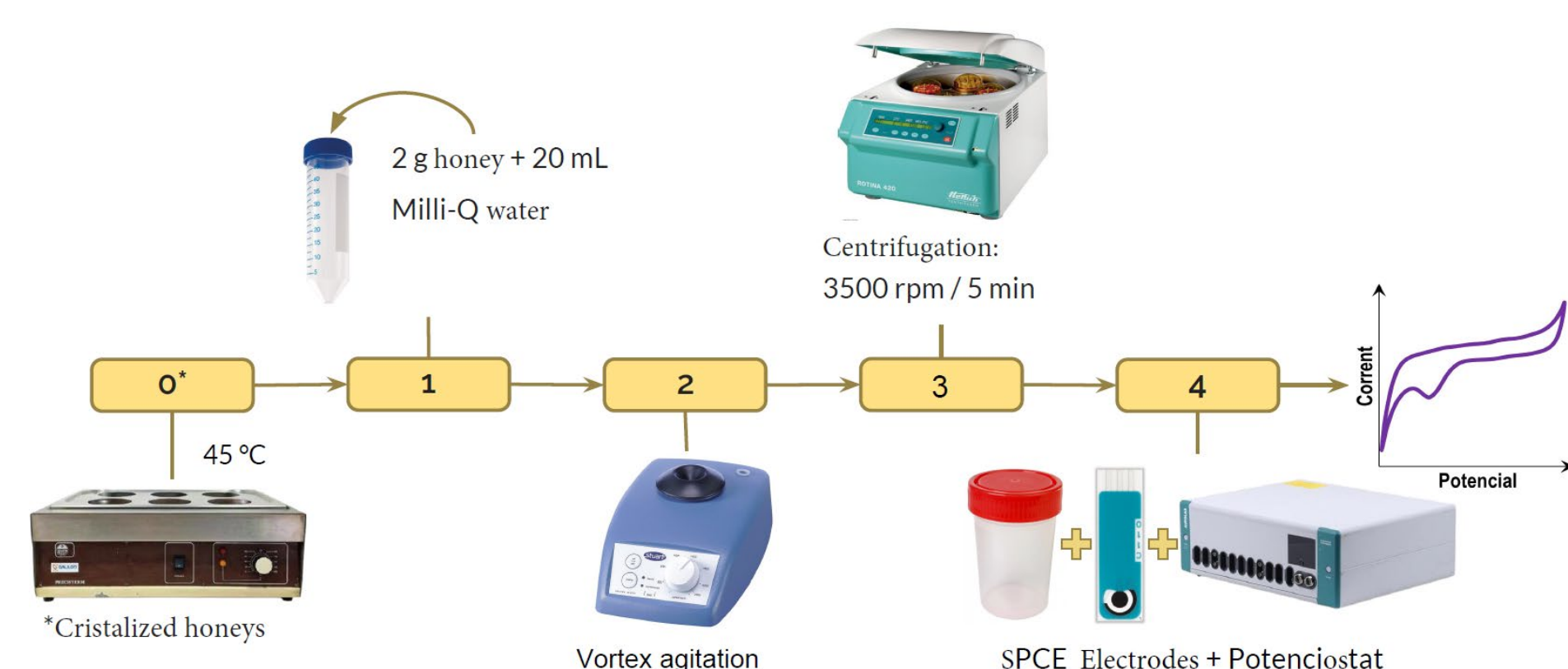
SAMPLES



110 Honeys

- Blossom Honeys**
 - Blossom
 - Eucalyptus
 - Lavender
 - Rosemary
 - Thyme
 - Heather
- Honeydew Honeys**
 - Almond
 - Holm oak
 - Chestnut
 - Mountain
 - Forest

SAMPLE TREATMENT



CYCLIC VOLTAMMETRIC METHOD

