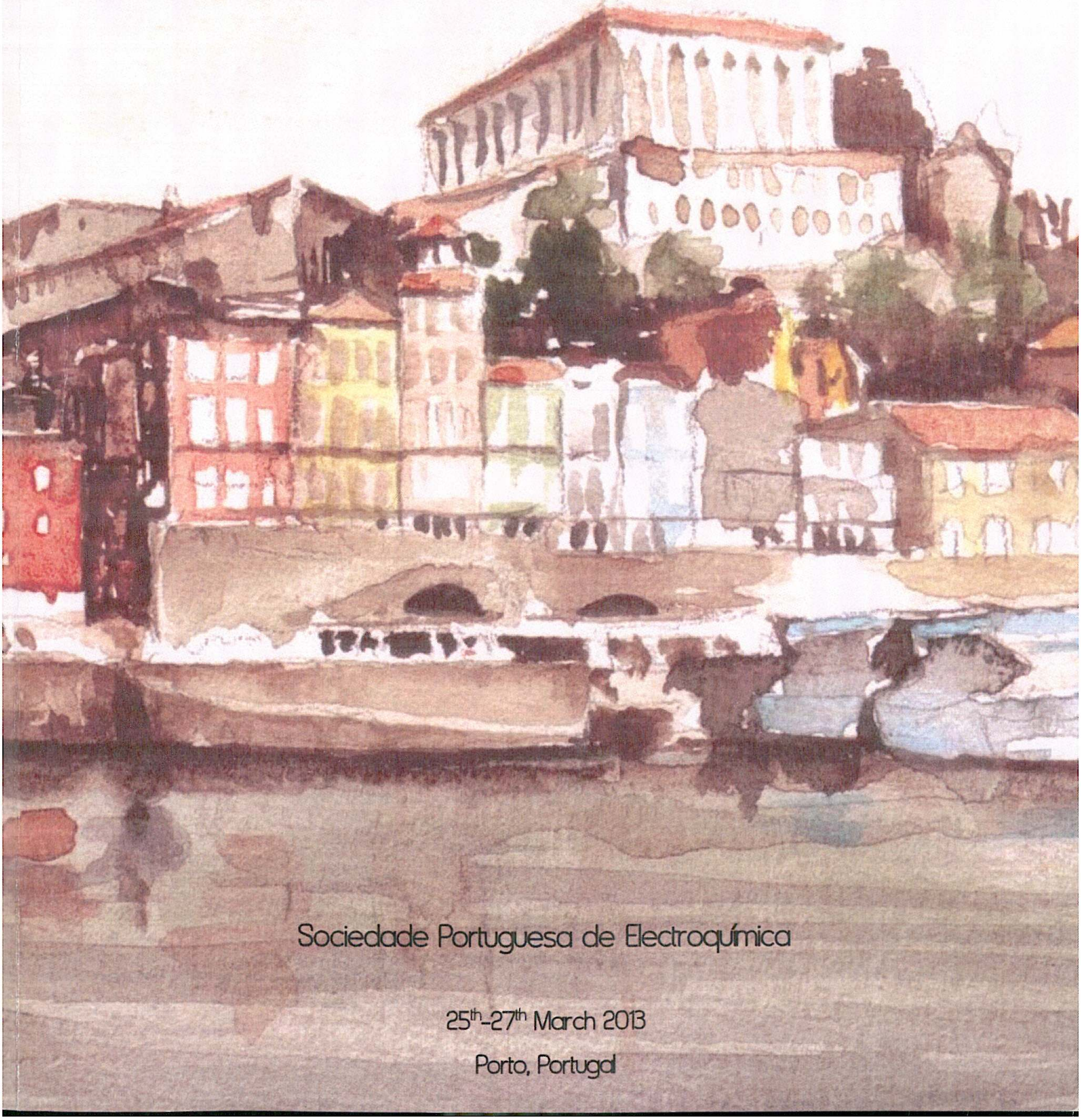
18th Meeting of the Portuguese Electrochemical Society



Sociedade Portuguesa de Electroquímica

25th-27th March 2013

Porto, Portugal

18th Meeting of the Portuguese Electrochemical Society

Sociedade Portuguesa de Electroquímica

Departamento de Química e Bioquímica
Faculdade de Ciências da Universidade do Porto
Porto
Portugal

25-27th March 2013

Title

18th Meeting of the Portuguese Electrochemical Society

Coordination

Aquiles Araújo Barros
Beatriz Quinaz
Daniel Oliveira Carvalho
Diana Fernandes
Inês Maria Valente
José António Rodrigues
Luísa Martins
Luís Ferreira Guido
Luís Moreira Gonçalves
Manuela Maria Moreira
Maria Isabel Rocha
Paulo Joaquim Almeida
Rui Miguel Ramos

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P2. Analysis of single-cultivar extra virgin olive oil using cyclic voltammetry

Andreia Fernandes[a], Luís G. Dias[a], José A. Pereira[a], Ana C.A. Veloso[b,c] and António M. Peres[a,d]

[a]CIMO – ESA, Instituto Politécnico de Bragança, Bragança, Portugal, [b]DEQB-ISEC, Instituto Politécnico de Coimbra, Coimbra, Portugal, [c]IBB–CEB, University of Minho, Braga, Portugal, [d]LSRE – ESA, Instituto Politécnico de Bragança, Bragança, Portugal

*peres@ipb.pt

Extra virgin olive oils (EVOO) quality evaluation is a complex task. The development of fast, simple and low-cost electrochemical methods to assess the quality of high-valued EVOOs, namely of "single-cultivar" EVOOs, which are very appreciated by consumers, is still a challenge task. Few works can be found in the literature regarding the application of sensor devices for classifying "single-cultivar" EVOOs according to the olive cultivar, in order to guarantee their authenticity. Cimato et al. [1] used the signals recorded with an electronic nose to separate among clusters of 12 different single-cultivar EVOOs. Apetrei et al. [2] showed that combining the electrochemical signal data obtained from electronic eye, nose and tongue allowed a good predictive classification capacity according to the olive variety of three single-cultivar EVOOs, with different degree of bitterness. In this work an approach based on cyclic voltammetry (CV) is proposed to analyze 4 different single-cultivar EVOOs (1 Portuguese (pt) and 3 Spanish (es) cultivars): Cobrançosa (C-pt), Manzanilla (M-es), Frantoto (F-es) and Redondilha (R-es). For each EVOO sample, 3 extractions were performed using a solution of ethanol/water (EtOH/H_2O 1:4; v:v). The CV technique has been evaluated using an Ag/AgCl double–junction reference electrode (M90-02, Orion) and two pairs of counter/working electrodes: (i) platinum (M241Pt, Radiometer) and silver (M295Ag, Radiometer) electrodes or (ii) two platinum (M241Pt and M21, Radiometer) electrodes. The resultant currents of the potentiostat-galvanostat device (PG580, Uniscan) have been acquired between -1.5 to +0.8 V (Pt/Ag) or -2 to +2V (Pt/Pt), at a potential scan rate of 100 mV/s (UiEChem v.1.34 software, Unisann Instruments Ltd) and considered for data analysis. The preliminary results, allow expecting that, the differences of shape and position of the peaks from the CV, observed from one extract to another, can be used to differentiate between single-cultivar EVOOs, according to cultivar and/or geographical origin.

[1] A Cimato, DD Monaco, C Distante, M Epifani, P Siciliano, AM Taurino, M Zuppa, G Sani, Sensors Actuators B, 2006, 114, 674–680.

[2] C Apetrei, IM Apetrei, S Villanueva, JA de Saja, F Gutierrez-Rosales, ML Rodriguez-Mendez, Analytica Chimica Acta, 2010, 663, 91–97.

ANALYSIS OF SINGLE-CULTIVAR EXTRA VIRGIN OLIVE OIL USING CYCLIC VOLTAMMETRY

Andreia Fernandes[a], Luís G. Dias[a], José A. Pereira[a], Ana C.A. Veloso[b,c] and António M. Peres[a,d]*

[a]CIMO - Escola Superior Agrária, Instituto Politécnico de Bragança, Portugal
[b]DEQB-ISEC - Instituto Politécnico de Coimbra, Coimbra, Portugal
[c]IBB–CEB - University of Minho, Braga, Portugal
[d]LSRE-ESA - Instituto Politécnico de Bragança, Portugal

*) peres@ipb.pt

INTRODUCTION

EVOOs - Extra virgin olive oils

↓

Quality evaluation is a complex task and carried out qualitatively by experienced olive oil tasters

↓

Important to develop fast, simple and low-cost electrochemical methods to assess the quality of high-valued EVOOs

↓

OBJECTIVE

↓

Cyclic Voltammetry (CV) for quality evaluation

↓

Application to "single-cultivar" EVOOs analysis

SAMPLES

4 Single-cultivar EVOOs

↓

1 **PORTUGUESE** (pt) cultivar:	Cobrançosa (C-pt)
3 **SPANISH** (es) cultivars:	Manzanilla (M-es) Frantoto (F-es) Redondilha (R-es)

EXPERIMENTAL PROCEDURE

EVOO SAMPLE TREATMENT

↓

3 extractions using EtOH/H_2O 1:4 (v:v)
(5 mL EVOO + 100 mL EtOH/H_2O mixture)

CV ANALYSIS

↓

2 mL of the final extract → phenolic compounds
10× Dilution with 0.1 M TBAP in acetonitrile

↓

No drying step
No re-dissolving step

CV EQUIPMENT

↓

Potentiostat-Galvanostat device

↓

Ag/AgCl reference electrode (M90-02)

+

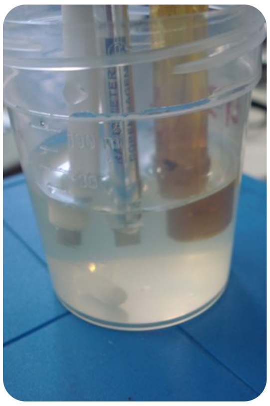
Two sets of electrodes:

1 – Platinum (M241Pt) – Counter electrode
Silver (M295Ag) – Working electrode

CONDITIONS: -1.5 to +0.8 V, 100 mV/s

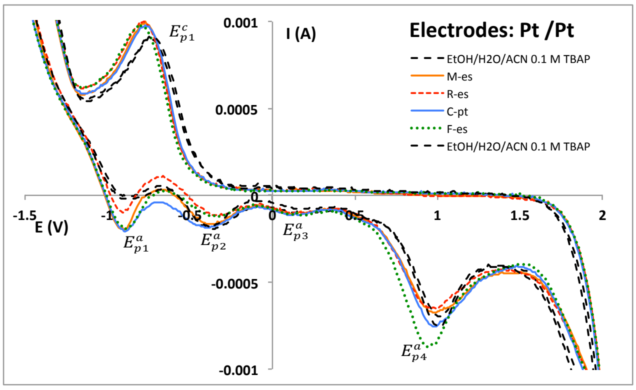
2 – Platinum (M241Pt) – Counter-electrode
Platinum (M21Pt) – Working electrode

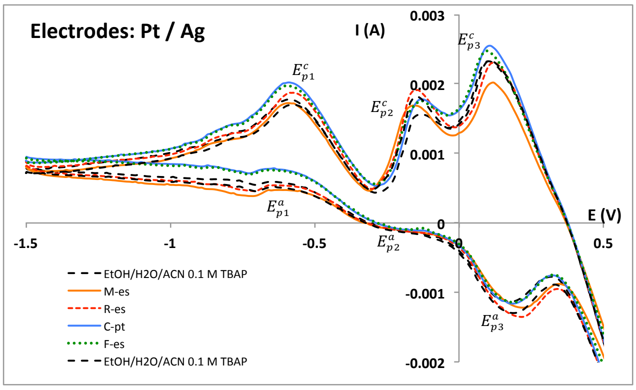
CONDITIONS: -2 to +2 V, 100 mV/s



PRELIMINARY RESULTS

Electrochemical response of the phenolic fraction extracted from the 4 single-cultivar EVOOs





✓ Set Pt-Ag electrodes:

→ 3 oxidation and 3 smaller back reduction peaks can be identified

→ current peaks ($E_p{}^a$ and $E_p{}^c$) vary slightly with the type of cultivar

✓ Set Pt-Pt electrodes:

→ 4 small oxidation peaks and 1 back reduction peak

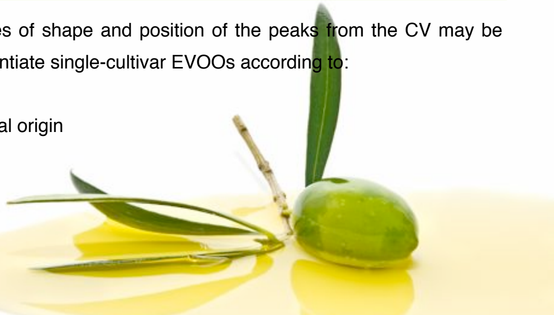
→ $E_p{}^a$ and $E_p{}^c$ values change with the type of cultivar

→ More clear differentiation among single-cultivar EVOOs

CONCLUSIONS

The differences of shape and position of the peaks from the CV may be used to differentiate single-cultivar EVOOs according to:

→ cultivar
→ geographical origin



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INSTITUTO POLITÉCNICO DE BRAGANÇA ipb Escola Superior Agrária
CIMO
LSRE Laboratory of Separation and Reaction Engineering
deqb Dep. Engenharia Química e Biológica
isec Instituto Superior de Engenharia de Coimbra
IBB