XXI Encontro Sociedade Portuguesa de Eletroquímica

XVIII Encontro Ibérico de Eletroquímica

XXI Meeting of the Portuguese Electrochemistry Society
&
XVIII Iberian Electrochemistry Meeting
Abstract Book

XXI Encontro da Sociedade Portuguesa de Eletroquímica
&
XVIII Encontro Ibérico de Eletroquímica
Livro de Resumos

Bragança, Portugal ◆ 14-17 setembro 2016

ipb INSTITUTO POLITÉCNICO DE BRAGANÇA

Title
XXI Meeting of the Portuguese Electrochemistry Society &
XVIII Iberian Electrochemistry Meeting

Título
XXI Encontro da Sociedade Portuguesa de Eletroquímica &
XVIII Encontro Ibérico de Eletroquímica

Event Abbreviation / Abreviatura do Evento
SPE2016

Coordination / Coordenação
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Edition / Edição
Instituto Politécnico de Bragança · 2016
5300-253 Bragança · Portugal
Tel. (+351) 273 303 200 · Fax (+351) 273 325 405
http://www.ipb.pt

Imaging services / Serviços de imagem
Atilano Suarez (Instituto Politécnico de Bragança, Portugal)

URI
http://hdl.handle.net/10198/12931

ISBN
978-972-745-213-2

OC12

Application of an electronic tongue for evaluating basic gustatory attributes perceived in table olives: qualitative and quantitative approaches.

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The organoleptic evaluation of table olives aiming their commercial classification according to sensory trade categories, although not being legally required, is recommended by the International Olive Council. This classification is based on the organoleptic evaluation of negative attributes usually found in table olives (and their respective brine solutions), performed by trained sensory panels. However, the training and implementation of such panels is time-consuming, costly and has some drawbacks like the low number of samples that can be assessed per day as well as the intrinsic degree of subjectivity of the evaluations carried out by the trained panelists. Besides the perception of sensory defects (type and intensity), panelists are usually asked, among other characteristics, to assess the intensity of basic gustatory attributes (e.g., acid, bitter and salty), which knowledge is useful for table olives quality control. In this work, and for the first time, the potential use of a home-made electronic tongue for discriminating standard aqueous solutions of chemical compounds (obtained with mineral water and in the concentration ranges used during sensory panels training sessions) that mimic the 3 basic tastes is evaluated: tartaric and citric acids (0.01 to 2 g/L; for acid taste); caffeine and anhydrous quinine (0.01 to 3 g/L; for bitter taste); and, sodium and potassium chloride (0.5 to 25 g/L; for salty taste). The results showed that a linear discriminant model based on the potentiometric signals recorded by a sub-set of 5 sensors (composed by cross-sensitivity lipidic membranes) could correctly classify the standard solutions according to the basic taste mimicked with sensitivities of: (i) 98% for the leave-one-out cross-validation; and (ii) 98% ± 3% (ranging from 91% to 100%) for the repeated K-folds cross-validation (K = 4 folds with 10 repeats, guaranteeing that 25% of the original data was kept for internal-validation purposes). Furthermore, the potentiometric signal profiles recorded by the electronic tongue during the analysis of table olives and respective brine solutions (40 different samples) were used, for the first time, to quantitatively estimate the median intensity of the same gustatory attributes (acid, bitter and salty) perceived by a sensory panel (composed by 8 trained panelists) during the simultaneous analysis of table olives and brine solutions. The results showed that it was possible to establish satisfactory multiple linear regression models based on sub-sets of signals gathered during the analysis of the table olives and/or brine solutions (varying from 21 to 25 depending on the basic taste), also selected by applying the simulated annealing variable selection algorithm: (i) $R^2 \geq 0.968$ for leave- one-out cross-validation; and (ii) $R^2 \geq 0.97 \pm 0.02$ for the repeated K-folds cross-validation (K=4 folds with 10 repeats). These preliminary

qualitative and quantitative results allow foreseen the practical application of the electronic tongue for assessing gustatory basic tastes on table olive real samples, which could be used as a helpful tool for the hard task required to sensory panelists.