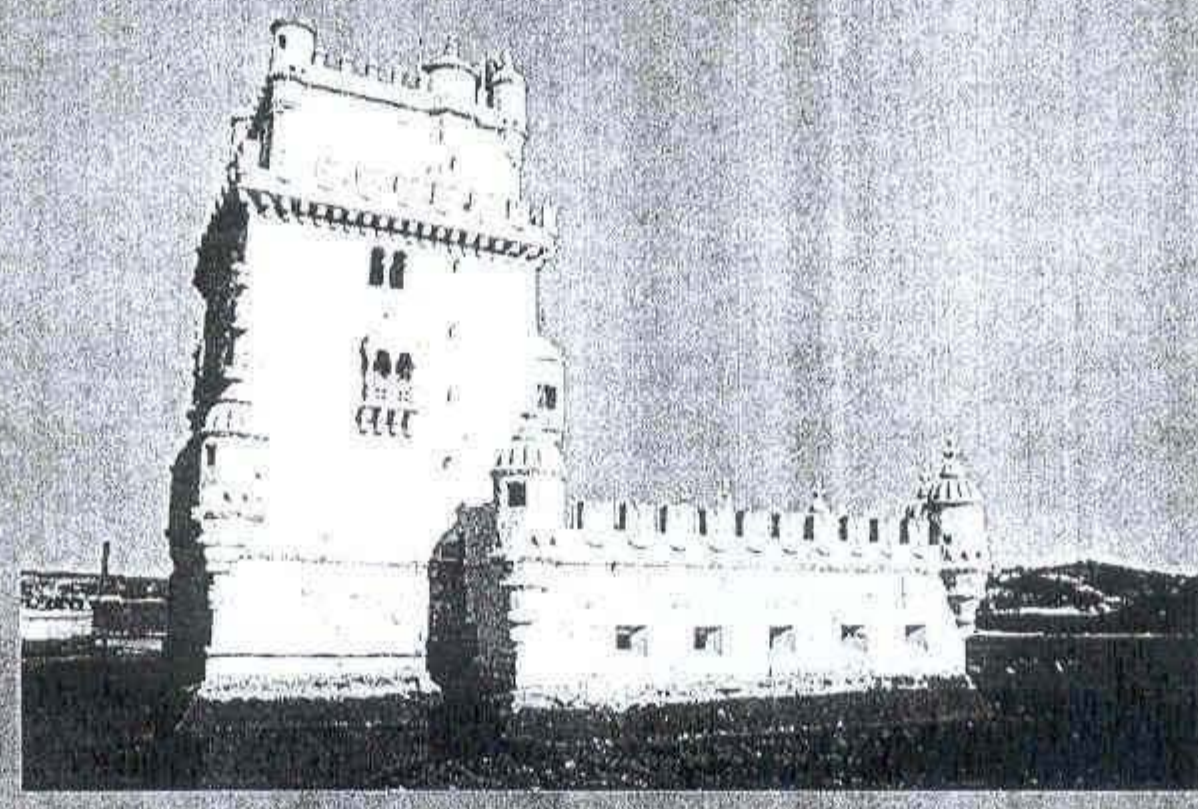
AOAC EUROPE SECTION
INTERNATIONAL WORKSHOP

Enforcement of European Legislation on Food and Water: Analytical and Toxicological Aspects

And

II ENCONTRO NACIONAL DE BROMATOLOGIA, HIDROLOGIA E TOXICOLOGIA



ABSTRACTS BOOK

Lisbon, 17th and 18th of April 2008

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Toxicological Methods

The ROS and RNS scavenging activity of 2-styrylchromones are effectively reproduced by cyclic voltammetry analysis

Ana Gomes [a], Eduarda Fernandes [a], M. Beatriz Q. Garcia [a], Artur M. S. Silva [b], Clementina M. M. Santos [b], Diana C. G. A. Pinto [b], José A. S. Cavaleiro [b], and José L.F.C. Lima [a]

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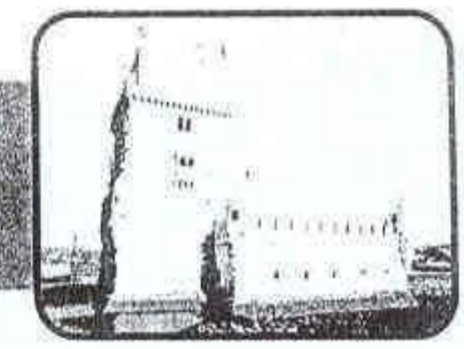

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Toxicological Methods

The ROS and RNS scavenging activity of 2-styrylchromones are effectively reproduced by cyclic voltammetry analysis

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2-Styrylchromones (2-SC) are a chemical family of heterocyclic compounds, vinylogues of flavones (2-phenylchromones), whose occurrence in nature has been reported. Recently, several 2-SC derivatives were demonstrated to entail antioxidant properties, namely, xanthine oxidase inhibition, hepatoprotection against pro-oxidant agents in cellular and non cellular systems, and scavenging activity against reactive oxygen and reactive nitrogen species (ROS and RNS).

The capacity of phenolic compounds, especially the hydroxylated derivatives, to scavenge free radicals is intimately related to their effectiveness to donate hydrogen atoms (H.). Electrochemical oxidation can be used as a model for the scavenging reaction since both redox models involve the breaking of the same O-H bond and the donation of e- and H+.

Thus, the aim of the present study was to compare the antioxidant effectiveness of 2-SC by different methodologies: the scavenging of ROS and RNS, studied by molecular spectroscopy (fluorescence, chemiluminescence, and UV-Vis absorption), and the electrochemical oxidation, studied by cyclic voltammetry.

The results from the scavenging assays were in agreement with those from the cyclic voltammetry, i.e., higher scavenging effects corresponded to lower values of oxidation potentials. Thus, in this family of compounds, oxidation potentials obtained by cyclic voltammetry seem to be applicable as indicators of radical scavenging ability.

Acknowledgment: The authors acknowledge FCT and FEDER financial support for the project POCI/QUI/59284/2004. Ana Gomes acknowledges FCT and FSE her PhD grant (SFRH/BD/23299/2005).

THE ROS AND RNS SCAVENGING ACTIVITY OF 2-STYRYLCHROMONES IS EFFECTIVELY REPRODUCED BY CYCLIC VOLTAMMETRY ANALYSIS

Ana Gomes [a], Eduarda Fernandes [a], M. Beatriz Q. Garcia [a], Artur M. S. Silva [b], Clementina M. M. Santos [b], Diana C. G. A. Pinto [b], José A. S. Cavaleiro [b], and José L.F.C. Lima [a]

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INTRODUCTION

2-Styrylchromones (2-SC) are a chemical family of heterocyclic compounds, vinylogues of flavones (2-phenylchromones), whose occurrence in nature has been reported. Recently, several 2-SC derivatives were demonstrated to entail antioxidant properties, namely, xanthine oxidase inhibition[1], hepatoprotection against pro-oxidant agents in cellular[2] and non cellular systems[3], and scavenging activity against reactive oxygen and reactive nitrogen species (ROS and RNS)[4].
The capacity of phenolic compounds, especially the hydroxylated derivatives, to scavenge free radicals is intimately related to their effectiveness to donate hydrogen atoms ($H^{\cdot}$). Electrochemical oxidation can be used as a model for the scavenging reaction since both redox models involve the breaking of the same O-H bond and the donation of e^- and H^+ [5].
Thus, the aim of the present study was to compare the antioxidant effectiveness of 2-SC by different methodologies: the scavenging of ROS and RNS[4], studied by molecular spectroscopy (fluorescence, chemiluminescence, and UV-Vis absorption), and the electrochemical oxidation, studied by cyclic voltammetry.

EXPERIMENTAL PROCEDURES

Scavenging assays

The assays were performed in a microplate reader (Synergy HT, BIO-TEK) by different fluorescence, chemiluminescence and UV/Vis methodologies[4].

Cyclic Voltammetry

Electrochemical measurements were carried out in an Autolab electrochemical system (Eco Chemie model PGSTAT 10) and data acquisition was accomplished through GPES software (Version 4.6). Voltammetric signals were recorded at room temperature. The working electrode was a glassy carbon electrode (3.0 mm diameter), a Ag/AgCl (KCl 3M) electrode was used as reference and a carbon electrode was used as auxiliar. The glassy carbon working electrode was polished with alumina 0.075 mm aqueous slurry before every experiment. Cyclic voltammograms were obtained by a single cycle performed at a scan rate of 100 mV s^{-1}.

STATISTICAL ANALYSIS

Pearson correlation test was performed using GraphPad Prism version 5.00 for Windows, GraphPad Software, San Diego California USA, www.graphpad.com".

RESULTS

Significant correlations were found for H_2O_2, hypochlorous acid (HOCl), singlet oxygen ($^1O_2$), and peroxynitrite, indicating that the scavenging mechanism against these reactive species is based on redox reactions. No significant correlation was found for superoxide radical ($O_2^{\cdot-}$) (Table 2).

Table 1 – Chemical structures and oxidation potentials (Ep_{ox}) of the tested 2-SC

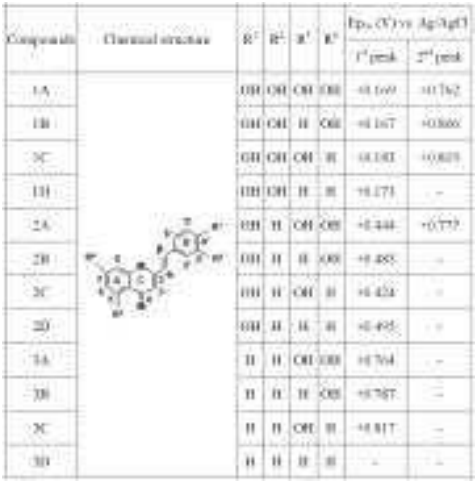
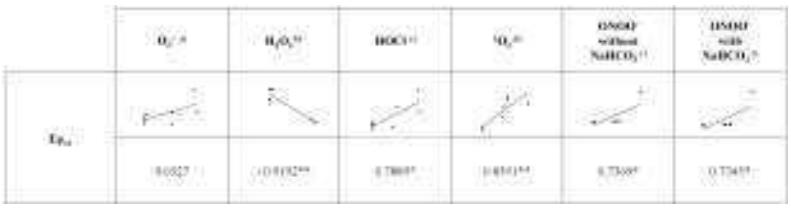


Table 2 – Correlations (Pearson correlation coefficients) between the Ep_{ox} and the scavenging activity against ROS and RNS[4] of the tested 2-SC



[a] IC_{27} ; [b] % effect at 125 µM; [c] IC_{50}; [d] IC_{30} ; *significant at $p < 0.05$. **significant at $p < 0.01$

CONCLUSION

The scavenging effects of the studied 2-SC are related to their electrochemical behaviour. Oxidation potentials can be used as a general indicator of radical scavenging ability.

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