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SHORT COMMUNICATION

Anti-oxidative properties of bi-1,2,4-triazine bisulphides

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The anti-oxidative properties of bitriazines (BTs) were evaluated using HPLC and cyclic voltammetry. In the first case, a RP-HPLC assay was made, using a fluorescence detector, hydroxyl radicals generated in Fenton reaction, and terephthalic acid as a spin trap. The measurements were performed using aqueous or methanolic solutions. It was found that when the BTs were dissolved in water they were antioxidants, while dissolved in methanol they were pro-oxidants. Their different physicochemical properties in both solvents were confirmed by voltammetric, chromatographic as well as spectrophotometric measurements.

Keywords: total antioxidant potential, RP-HPLC/DAD, cyclic voltammetry, bitriazines

Aliphatic bitriazines (BT), containing 1,2,4-triazine bisulphides tethered to poly(ethylene glycol) chains (Fig. 1, *II*–*V*), were synthesised, as described elsewhere (Ławecka et al., 2008, 2011), via a two-step one-pot procedure. This involved the *S*-alkylation of thiosemicarbazide with 0.5 equiv. of the appropriate poly(ethylene glycol) dibromides to give the corresponding di-quaternary salt, followed by condensation of the latter with glyoxal in the presence of sodium bicarbonate. BTs find applications in many areas of chemistry, such as catalysis (Malkov & Kočovský, 2007), coordination and supra-molecular chemistry, acting as chelating ligands (Lehn, 1995; Gokel et al., 2004), electronics, optoelectronic (OLED) (Pomeranc et al., 2001; Keefe et al., 2000), and in environmental chemistry as non-harmful pesticides. *S*-triazines are used on a variety of food and feed crops (grains, fruits, and nuts). They can be oxidised electrochemically or by the use of strong oxidants, such as hydroxyl radicals (da Silva et al., 2009).

Here, we present the preliminary results of the antioxidative properties of BTs (using an HPLC assay, relating to hydroxyl radicals (Głód et al., 2012a)).

HPLC chromatographic measurements were performed by means of a chromatograph comprising an Interface Box, 4 channel Smartline Manager 5000 with Degasser K-5004, Solvent Organiser K-1500, Dynamic Mixing Chamber, HPLC Pump Smartline 1000, UV-VIS Diode Array Detector Smartline 2800, Autosampler Smartline 3900, Smartline 4000 Column Thermostat (all from Knauer, Berlin, Germany), and RF-10AXL fluorometric detector (Shimadzu, Tokyo, Japan). Samples were separated on a Hypresil RP-18 5 μm, 250 mm × 3 mm (Merck, Darmstadt, Germany) column. The system was controlled and data acquisition performed on an IBM PC type computer with Eurochrom 2000 and Clarity Chrom V 2.6 2007 software.

Electrochemical measurements were performed using the Autolab PGSTAT20 potentiostat (Eco Chemie, Utrecht, Netherlands). The electrochemical cell was a closed standard three-electrode cell connected to a solution reservoir through a Teflon tube. A glassy carbon (GC) disk electrode, 2 mm in diameter, was used as a working electrode and a Pt gauze electrode as the counter electrode. All potentials refer to the saturated Ag/AgCl reference electrode. The system was controlled and data acquisition performed on the IBM PC type computer with GPES v 4.9 software. pH was measured using a pH meter OP-208/1 (Radelkis, Bu-

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