

Effect of heavy metals on the antioxidant activity of *Silene dioica*

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Abstract

This contribution is focused on study of photo-degradation of a several photoconductive organic materials such as polymeric (high T_g-PPV – block copolymer of derivates of poly(p-phenylene-vinylene) and P3HT – poly(3-hexylthiophene-2,5-diyl) as small molecular weight material a derivate of diphenyl-diketopyrrolo-pyrrole – DPP 36 was used. These materials are used for construction of optoelectronic devices like organic solar cells, transistors, optical sensors and others. Photo-degradation processes were studied by optical characterization (UV-VIS spectroscopy,) and by analysis of photographs obtained by means of optical microscope.

Keywords: UV-VIS spectroscopy, polymers, photodegradation

Introduction

Living organisms are constantly exposed to various health burdensome substances. Among these substances are also present heavy metals. These are traces of a part of the earth's crust and the environment is increasingly receiving the impact of human activity. Their effects on living organisms' produces a large number of biochemical reactions whose products may be free radicals, which in excess can cause oxidative stress. The protective system of the organism is based on the activity of specific enzymes (especially superoxid dismutase, glutathion peroxidase, catalase, glutathione reductase) as well as non-enzymatic compounds with antioxidant activity (L-ascorbic acid, glutathione). (Babula et al. 2008; Stratil et al. 2006; Krystofova et al. 2009)

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Materials and methods

In our experiment, we presented *Silene dioica* suspension cultures of different concentrations of cadmium ions (0, 10, 50 and 100 μM), and monitored its effect on antioxidant activity using DPPH methods, TEAC and FRAP. The DPPH• test is based on the ability of the stable 2,2-diphenyl-1-picrylhydrazyl free radical to react with hydrogen donors. The FRAP method (Ferric Reducing Antioxidant Power) is based on the reduction of complexes of 2,4,6-tripyridyl-s-triazine (TPTZ) with ferric chloride hexahydrate (FeCl₃·6H₂O), which are almost colourless, and eventually slightly brownish. Results obtained using this method are usually recalculated to Trolox® concentration and are described as “Trolox® Equivalent Antioxidant Capacity” (TEAC). For chemically pure compounds, TEAC is defined as the micromolar concentration of Trolox® equivalents demonstrating the same antioxidant activity as a tested compound (at 1 mmol·L⁻¹ concentration).

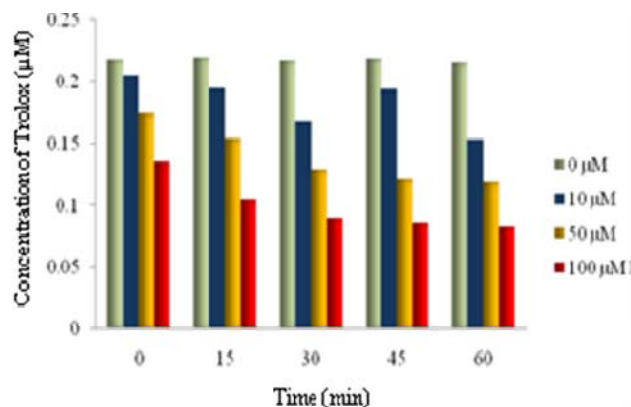


Figure 1: Diagram showing *Silene dioica* suspension cultures of different concentrations of cadmium ions (0, 10, 50 and 100 μM) using DPPH and FRAP methods

Results and Discussion

The results obtained showed that in the case of DPPH and FRAP showed a suspension culture compared to the control of the reduced antioxidant activity, with a loss of activity was proportional to the concentration-acting metal (Fig 1). In the case of the TEAC method was observed opposite trend in activity than previous methods,

namely the suspension cultures showed a higher antioxidant activity than the control for all the applied concentrations of heavy metals.

Conclusion

Environmental contamination by heavy metals is already known two-stroke problem. Unfortunately, the unintended consequences of contamination are still not entirely known. It is therefore necessary for their detection is of interest as their impact on living organisms metabolom to the contamination of the environment not easily identified, but also of arrest, or eliminate.

Acknowledgement

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