

PB9) Characterization of Chlorophyll
Fluorescence from *Lemna* Plants under
Cadmium stress

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1. Introduction

Cadmium is highly toxic for humans, animals and plants. In plants, cadmium causes reductions in membrane function, enzymatic activities, photosynthesis, nutrient uptake, etc. As a consequence, various symptoms of injury such as chlorosis, growth inhibition and death are observed in Cd²⁺-exposed plants. *Lemna* is more sensitive to metal pollution and therefore is used as experimental model systems to investigate heavy metal-induced responses of plants. The effect of Cd²⁺ ions on the Chl a fluorescence were investigated using leaves of hydrophytes (e.g. *Lemna*, *Salvinia*, *Ricciocarp*, *Nymph*, *Typha* plants) in order to selection of Cd²⁺-sensitive plant species and get more information on physiological responses of plants to Cd²⁺ stress.

2. Material and Methods

Lemna plants were treated with different concentrations of CdCl₂ (0, 10, 30, 50, 100 and 200uM) in the nutrient medium as described by Teisseire and Vernet (2000). The Chl a fluorescence transient was measured at room temperature by the Plant Efficiency Analyzer (PEA, Hansatech Ltd., UK) with an actinic light of 1,500mole/m²/s (Strasser and Strasser, 1995). The Chl a fluorescence imaging was performed using a commercial imaging fluorometer (Fluorcam 700MF, P.S. Instrument, Czech Republic) described in Nedbal *et al.* (2000).

3. Results and Conclusions

In Cd²⁺-treated plants, the maximum photochemical efficiency of PSII, Fv/Fm, decreased according to the increase of Cd²⁺ concentration and treatment time contrary to non-treated plants. *Lemna* plants were more sensitive and *Nymph* plants were tolerant to cadmium stress. In *Lemna* plants, the decrease of Fv/Fm was caused by the drop of Fm. The Chl a fluorescence transient O-J-I-P was also considerably affected by Cd²⁺

ions; it followed a typical polyphasic rise in non-treated plants, while in Cd^{2+} treated plants the fluorescence yield decreased in steps J, I and P. Analysis of the Chl a fluorescence transient according to the JIP test allows establishment of structural and functional parameters, providing the quantification of the photosystem's behaviour. Among functional parameters, the TR/RC and ET/RC decreased in contrast of the increase of the ABS/RC depending on the increase of Cd^{2+} concentration. The structural parameters, Φ_{po} , Ψ_o and Φ_{eo} , decreased depending on the increase of Cd^{2+} concentration. *Lemna* plants are more sensitive to cadmium stress and therefore will be used as experimental model systems to investigate heavy metal-induced responses of plants.

Reference

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