From whole cyanobacterial cells of *Synechococcus elongatus* PCC 7942 to PSII: the effect of diuron on photosynthesis

Robert Ruginescu[1], Alina Vasilescu[2], Roberta Maria Banciu[2], Szilveszter Gaspar[2], Cristina Purcarea[1]

[1]*Department of Microbiology, Institute of Biology Bucharest of the Romanian Academy, 296 Splaiul Independentei, 060031 Bucharest, Romania*

[2]*International Centre of Biodynamics, 1B Intrarea Portocalelor, 060101 – Bucharest, Romania*

The cyanobacterial strain *Synechococcus elongatus* PCC 7942 was longtime used as a model in biosensors for the detection and study of photosynthesis-inhibiting pesticides [1]. Choosing the optimal bioreceptor providing the best combination of stability, high photocurrents and good sensitivity to herbicide is a key point for developing efficient analytical devices. Whole cells and subcellular preparations of thylakoids and photosystem II (PSII) particles present each particular advantages. In this context, the current investigation compared the photosynthetic activity and sensitivity to diuron of whole cells, thylakoid membranes and PSII particles from *S. elongatus* PCC 7942. *Synechococcus elongatus* PCC 7942 was cultivated in BG-11 medium up to an OD (730 nm) of 0.9, then lysed to obtain thylakoid membranes [2]. PSII particles were obtained from thylakoids by extraction with detergent, ultracentrifugation and separation in sucrose gradient [3]. The stability of the investigated photosynthetic preparations at -20° C in the presence of DMSO, glycerol and PEG-8000 as stabilizers was also investigated.

The photosynthetic activity was measured via amperometry using screen-printed 3-electrode cells that include a working carbon nanotube electrode, a carbon counter electrode and an Ag reference electrode (DRP-110 D CNT, from Metrohm Dropsens, Spain). The measurements were conducted in 20 mM phosphate buffer pH 7, with 0.15 mM NaCl and 1mM $MgCl_2$, in the presence of 0.5 mM 2,6-dichlorbenzoquinone (DCBQ) as electrochemical mediator. The cell was illuminated with white light for 1 min light/15 min dark cycles. All samples were diluted to have 7.5 µg/mL chlorophyll in the cell. The intensity of the photocurrent after 1 min of illumination was compared to that measured in similar conditions after the incubation with 60 ppb diuron. It was confirmed that the all preparations tested were suitable for the electrochemical detection of diuron.

Thylakoids, showing good stability and sensitivity were studied in more detail. The morphology of thylakoid membrane from *S. elongatus* PCC 7942 was studied by atomic force microscopy (AFM). Moreover, thylakoids were immobilized on CNT-electrodes with redox polymer G43 using PEDGDE cross-linker [4]. In this case, no additional mediator was needed so the measurements were performed in buffer without DCBQ, but the photocurrents were reduced. It

was confirmed that sensors based on thylakoids immobilized on top of electrodes are adequate to study photosynthesis-inhibiting herbicides. In perspective, we aim to address the selectivity of the sensors and test real water samples.

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