Supporting Information

Investigation of Photocurrents Resulting from Living Unicellular Algae Suspension with Quinones over Time

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1. *Kinetic quenching : the 2,6-DMBQ case*

When 2,6-DMBQ is considered, the $Q_X = f(t)$ curve does not lead to saturation effect. Furthermore, the points at short times lead to very low values. This is why incertitude cannot be neglected while the Q_X increase seems to take place. In this case, the initial value of the quenching needs to be re-estimated. Considering equation (7), it means that kt << 1. Therefore, $e^{-kt} \sim 1-kt$ and equation (S1) can be written :

$$Q_X = K_X(1-e^{-kt}) \; ; \; K_X kt \tag{S1}$$

As described in the text, the global quenching parameter is :

$$Q_{total} = Q_0 + Q_X \tag{S2}$$

Q_0 is the instantaneous quenching due to quinones under light experiments that does not depend on quinone time incubation. Q_X is the kinetic quenching. As a consequence, one can deduce :

$$Q_{total} = Q_0 + K_X kt \tag{S3}$$

The $Q_{total} = f(t)$ curve (**Figure S1**) is thus expected to be a straight line with a slope corresponding to $K_X k$ that finally helps to calculate the k value.

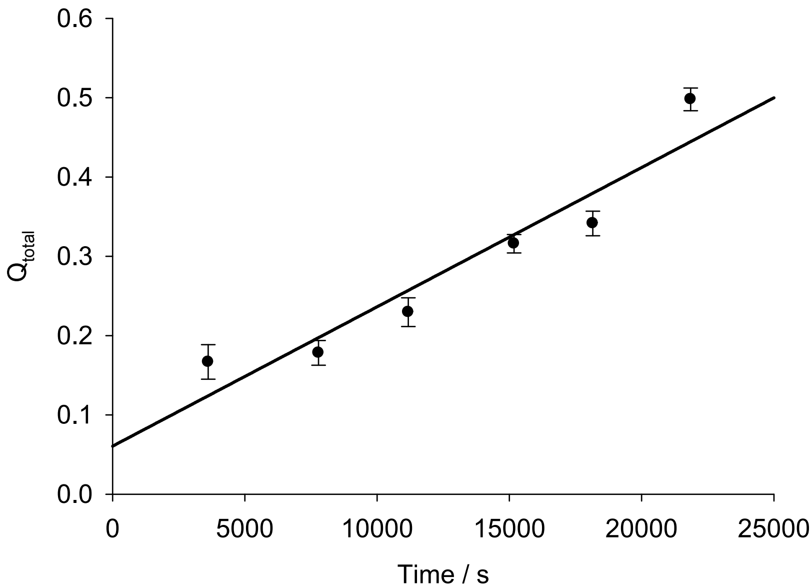

Figure S1. $Q_{total} = f(t)$ curve ($Q_{total} = 0.606 + 1.76 \times 10^{-5} t$; $R^2 = 0.91$) when the cell suspension is incubated with 2,6-DMBQ (25 µmol.L^{-1}).

2. Kinetic quenching parameter for 2,6-DCBQ as a function of concentration

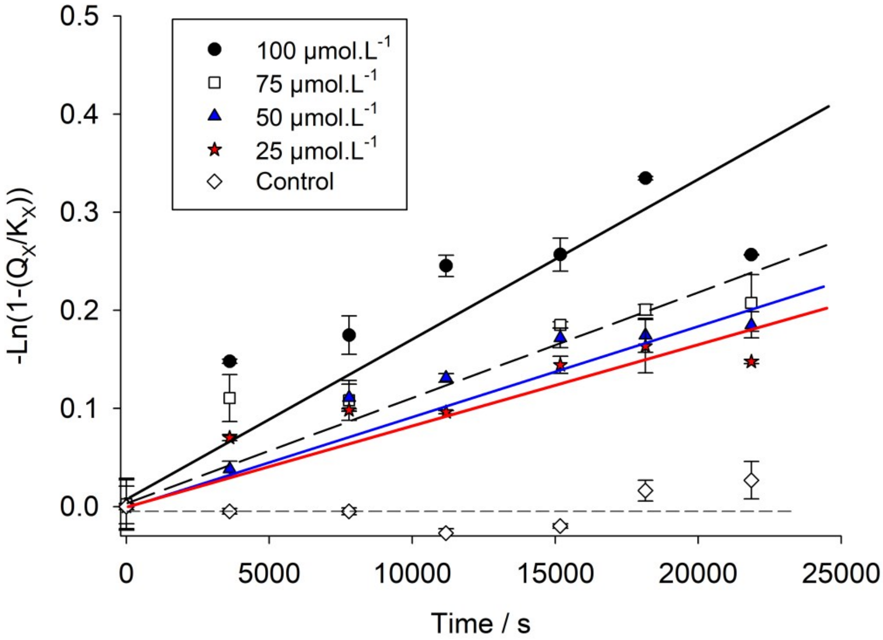

Figure S2. Kinetic quenching as a function of time for different 2,6-DCBQ concentrations: 100 µmol.L^{-1} (black circles), 75 µmol.L^{-1} (white squares), 50 µmol.L^{-1} (blue triangles), 25 µmol.L^{-1} (red stars), without any quinone (white diamonds). Linear fits obtained for the different 2,6-DCBQ concentrations: 100 µmol.L^{-1} (black line), 75 µmol.L^{-1} (hatched line), 50 µmol.L^{-1} (blue line), 25 µmol.L^{-1} (red line), without any quinone (dotted line).

Concentration (µmol.L^{-1})	10^5k (s^{-1})	R^2
100	1.9 ± 0.2	0.97
75	1.0 ± 0.2	0.91
50	0.97 ± 0.08	0.97
25	0.90 ± 0.04	0.99
0 (control)	0 ± 0.01	-

Table S1. Apparent rate constants of the quencher X production for different 2,6-DCBQ concentrations.

3. Fraction of open centers as a function of 2,6-DCBQ concentration

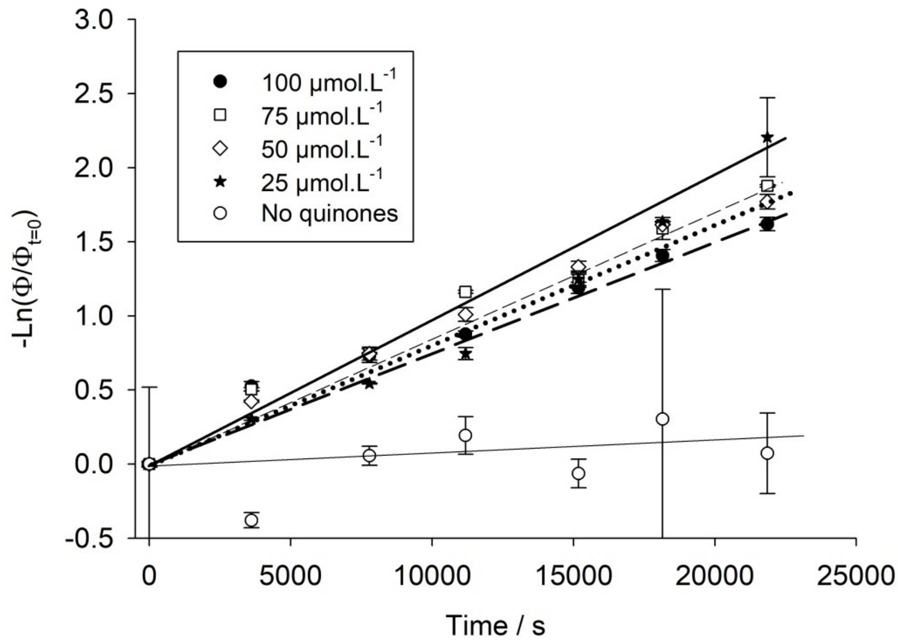

Figure S3. Fraction of open centers Φ as a function of time for different initial 2,6-DCBQ concentrations : 100 µmol.L^{-1} (black circles), 75 µmol.L^{-1} (white squares), 50 µmol.L^{-1} (white diamonds), 25 µmol.L^{-1} (black stars), without any quinone (white circles). Φ values are normalized by the initial Φ value at t = 0, i.e. just after the 2,6-DCBQ addition.

Concentration (µmol.L^{-1})	10^5k' (s^{-1})	R^2
100	7.8 ± 0.3	0.99
75	8.7 ± 0,2	0.99
50	8.5 ± 0.2	0.99
25	9.8 ± 0.3	0.99
Control	0 ± 0.5	-

Table S2. Extracted apparent rate constants from the analysis of the proportion of open centers as a function of time for 2,6-DCBQ (see text).

4. Effects of hydroquinone as a function of time

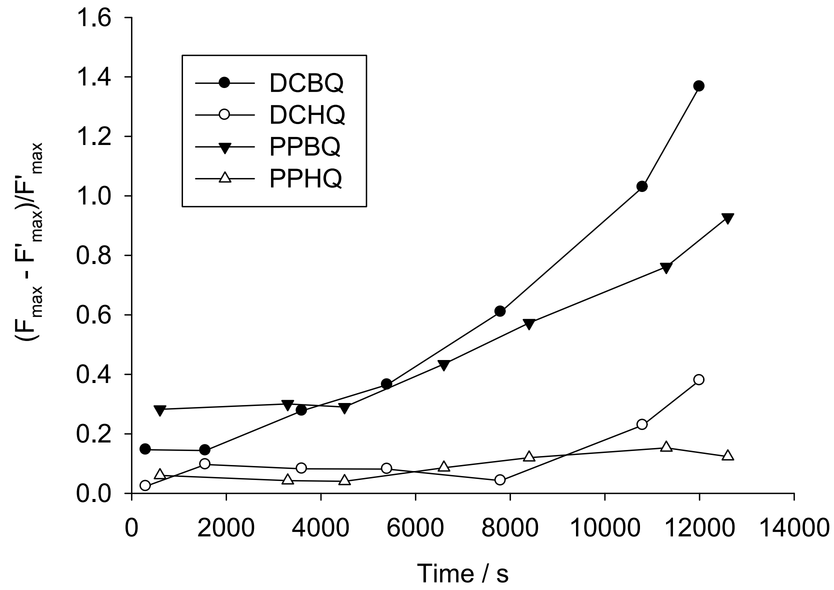

Figure S4. Quenching parameter as a function of time for two quinones and their corresponding hydroquinone forms (C = 20 µmol.L^{-1} with a suspension of *Chlamydomonas reinhardtii ΔpetA* algae (10^7 cells.mL^{-1})). Contrary to quinones, hydroquinones lead to absence of quenching during all the incubation time.