Fig. 1S. Difference curves revealing effects of moderately high temperature on OJIP transients in mature leaves of Bulgarian (BG, Fig. 1S.A) and Italian (IT, Fig. 1S.B) ecotypes *P. orientalis*. Details in the characteristic L, K, H and G bands are presented on panel C for BG ecotype, and on panel D for IT ecotype plane trees.

Each DC value was calculated by subtracting the values of relative variable fluorescence $V_t$ [$V_t = (F_t - F_0)/(F_M - F_0)$] for mature leaves on day 0 from respective values of $V_t$ for other experimental days, e.g. for Day 3 $\Delta V_t = V_t_{(Day3)} - V_t_{(Day0)}$. The presented on the graphics days of the experiment are: Day 0 – control day; Day 3 – third day of the temperature treatment; Day 4 – first day of recovery; and Day 6 – third day of recovery. DC for the specific steps of the induction curve ($\Delta W$) were calculated analogously to the relative variable fluorescence ($\Delta V_t$) for O-P transient, as follow: for O-K phase, L band: $W_t(OK) = (F_t - F_0) / (F_K - F_0)$; $\Delta W_{OK} = W_t(OK)_{(day of the experiment)} - W_t(OK)_{(Day 0)}$; for O-J phase, K band: $W_t(OJ) = (F_t - F_0) / (F_J - F_0)$; $\Delta W_{OJ} = W_t(OJ)_{(day of the experiment)} - W_t(OJ)_{(Day 0)}$; for J-I phase, H band: $W_t(JI) = (F_t - F_J) / (F_I - F_J)$;
\[ \Delta W_{JI} = W_{t(JI)}(\text{day of the experiment}) - W_{t(JI)}(\text{Day 0}); \]
for I-P phase, G band: \[ W_{t(IP)} = \frac{(F_t - F_I)}{(F_P - F_I)}; \]
\[ \Delta W_{IP} = W_{t(IP)}(\text{day of the experiment}) - W_{t(IP)}(\text{Day 0}). \]

The information we obtain from the parameter \( W_{OJ} \) is almost the same as with \( F_K/F_J \). We analyzed the correlation between values of the both parameters for the whole experimental data set that we used in our study, and found high Pearson correlation coefficient \( R=0.95, p=0 \), the number of experimental points, \( n=1417 \). That is why we used the \( W_{OJ} \) parameter to evaluate the changes in the chlorophyll fluorescence at the K band. Fig. 2S illustrates the correlation between the both mentioned parameters.

![Fig. 2S. Correlation between the parameters \( W_{OJ} \) and \( F_K/F_J \).](image)

The correlation between the values of the both parameters for the whole experimental data set was analyzed, and the obtained Pearson correlation coefficient is \( R=0.95, p=0 \), the number of experimental points, \( n=1417 \).
DF is a result of backward electron flow and charge recombination in the RC of PSII, which lead to a secondary excitation of the Chl a molecules (Goltsev et al. 2004, Goltsev et al. 2009b). Even though the photosynthetic electron transport has a high efficiency, all redox reactions are reversible and recombination between separated charges in PSII RC is possible. The following secondary excitation of the RC chlorophyll leads to repopulation of the excitations in the antenna Chl molecules and eventually emission of the energy as light quanta, called DF (Zaharieva and Goltsev 2003, Kalaji et al. 2014c). Backward electron transport can be generated at every step of the electron transport chain thus giving life to various light emitting precursors. DF is not a result of a single reaction but a sum of many
independent sources of energy excitation, each of them generates different kinetic components of DF, different in their light intensity and lifetime (Li et al. 2007). Decay kinetics is considered as a decay curve of multiple overlapping components. Each component is a result of electron recombination in a specific PSII redox state (Markovic et al. 2001).

The main PSII redox states able to generate DF are \( P_{680}^+\text{Pheo}^- \), \( P_{680}^+Q_A^- \), \( Z^+Q_A^- \), \( S_{i+1}ZQ_A^- \), \( Z^+Q_B^- \), and \( S_{i+1}ZQ_B^- \).

The first DF emitting states are a result of \( P_{680}^+Q_A^- \) recombination and lay in the microsecond range of decay time – 1 μs, 5-10 μs, and 35-40 μs components (Goltsev et al. 2009b, a). They reflect the state of PSII electron donor side. Sub-millisecond DF (120-200 μs) is generated by \( Z^+Q_A^- \) state and depends on \( Q_B \) redox state – when \( Q_B \) is fully oxidized, the electron flow from \( Q_A \) has high rates. When \( Q_B \) is semi-reduced, \( Q_B^- \), this component is observed in 700 μs time region of DF decay. The first millisecond component (1-2-3.5 ms) depends on RCs in \( S_3 \) OEC state and later on \( Q_A^- \) reoxidation while \( Q_B^- \) become fully reduced (Goltsev et al. 2009a). The time course of DF decay at this interval is determined by PQH\(_2\) exchange with oxidized PQ pool:

\[
S_3Z^+P_{680}Q_A^-Q_B^- + PQ + 2H^+ \rightarrow S_3Z^+P_{680}Q_A^-Q_B^- + PQH_2
\]

DF recorded in later periods of time originates from \( S_2 \) and \( S_3 \) OEC states recombination with \( Q_A^- \) and \( Q_B^- \): \( S_2Q_B^- \) and \( S_3Q_B^- \).

The initial part of the DF decay curve can be interpreted mathematically as a sum of exponents (Lavorel 1975). Different components vary by the characteristic time of decay (τ) and the amplitude, \( L \) (Christen et al. 2000):

\[
L(t) = \sum_i L_i e^{-\frac{t}{\tau_i}}
\]

where \( L(t) \) is DF, emitted at time \( t \) after the switching the illumination off, \( L_i \) is the amplitude of the \( i \)-component with characteristic lifetime \( \tau_i \).

Each decay curve can be presented as a three exponential function:
\[ DF(t) = L_1 e^{-t/\tau_1} + L_2 e^{-t/\tau_2} + L_3 e^{-t/\tau_3} + C \]

The constant C introduces all slow components as well as the background electric signal (noise). \( L_1, L_2 \) and \( L_3 \) are proportional to the concentrations of the light emitting species and its quantum yield. The characteristic lifetime for each component \( (\tau_1, \tau_2 \) and \( \tau_3) \) decreases with \( 1/e \) and is reversely proportional to the rate constant of the reaction, leading to each state disappearance (Goltsev et al. 2004, Goltsev et al. 2009b, Kalaji et al. 2014b).

**Fig. 4S.** Dynamics of the P700 + PC oxidation and re-reduction measured by MR820 signal for Bulgarian (BG, 4S \( A \)) and Italian (IT, 4S \( B \)) ecotypes are shown for 4 days of the experiment: Day 0 – control day; Day 3 – third day of the temperature treatment; Day 4 – first day of recovery; and Day 6 – third day of recovery. The regions of the curves, where the MR820 signal is practically linearly dependent on time, allow rates of oxidation \( (V_{OX}) \) and reduction \( (V_{RED}) \) to be derived from maximal slopes of the MR820 curves approximately at points, indicated by arrows.