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Chlorophyll *a* luminescence – an index of photoinhibition damages

Antoni Murkowski, Elżbieta Skórska

Studies of photoinhibition of wheat, cucumber and rape leaves of plants, growing in laboratory conditions (120 $\mu E \times m^{-2} \times s^{-1}$ PAR; 22°C), were conducted using chlorophyll *a* fluorescence induction and delayed luminescence. Parameters F_v/F_m, S_c/F_m, Rf_d, $t_{1/2}$, F_o and L_d were measured after 2 hours of high irradiance (700 $\mu E \times m^{-2} \times s^{-1}$ PAR) at 22°C and 4°C of wheat and cucumber leaves. High irradiance and chill influenced very strongly photoinhibition in cucumber leaves reflected in considerable reduction of all parameters as well fluorescence induction as delayed luminescence. These photoinhibition damages were irreversible after 24 hours of samples recovery in the growth conditions not all measured parameters came back to the control level. In a case of wheat leaves, photoinhibition changes have been smaller and reversible. The analysis of parameters of the chlorophyll *a* fluorescence induction of the control rape variety Lirajet leaves and the triazine-resistant line 5972/2/89 of rape shows that the physiological condition of the triazine-resistant plants is worse than of those having the modified protein D1-32 kDa. The resistance to triazines has been in this case achieved at the cost of photochemical processes efficiency reduction, which is shown by the deterioration of the most of parameters of fluorescence induction. The electron transport rate in PSII in the leaves of triazine- resistant line of rape decreased, what is shown by over 20 times decrease of the coefficient L_d. The obtained results show on an important role of electron transport on primary photosynthetic reactions and on the fundamental role of the D1 protein in PSII. Luminescence methods can be used for the estimation of photoinhibition degree, especially the regularity of primary photosynthetic reactions. The luminescence parameters, particularly those of delayed luminescence kinetics, inform about the structure and function of the primary quinone acceptor Q_A and Q_B in the photosystem II.