The detailed quenching protocol with major parameter abbreviations and important calculation formulas

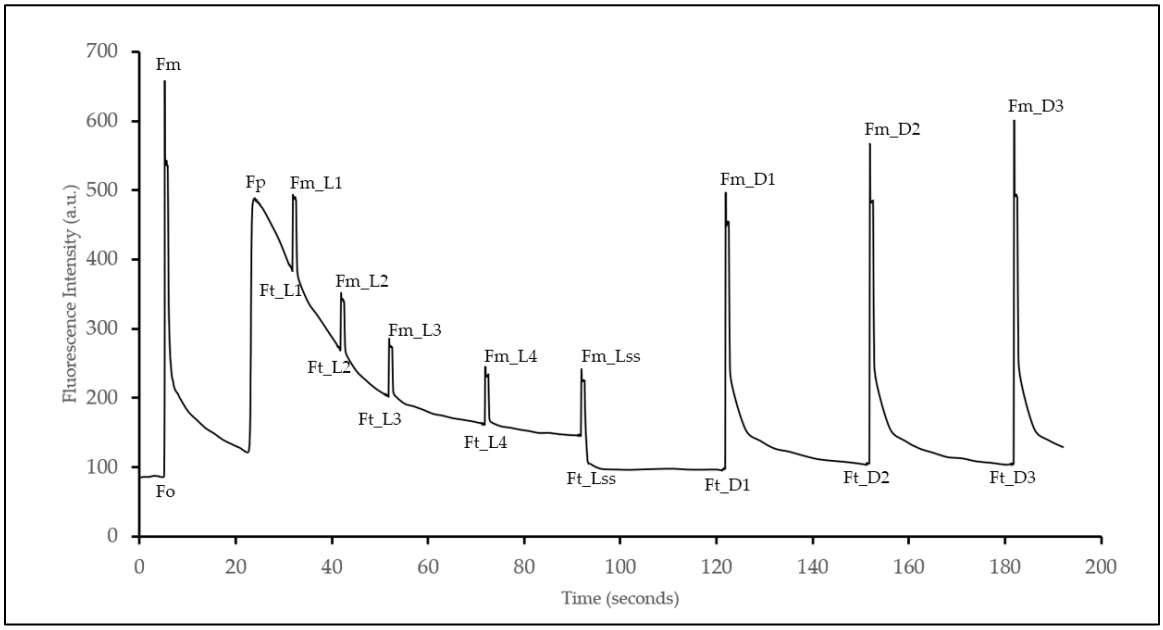

Fig a. Detailed quenching protocols

Abbreviations:

Fo, the minimum fluorescence; *Fm*, maximum fluorescence; *Fm_Ln*, the maximum fluorescence in light; *Fm_Lss*, the steadystate maximum fluorescence in light; *Fm_Dn*, the instantaneous maximum fluorescence signals in dark; *Fp*, the peak rise fluorescence; *Ft_Ln*, the instantaneous fluorescence in light; *Ft_Lss*, the steady-state fluorescence in light; *Ft_Dn*, the instantaneous fluorescence signals before the saturating flashes; *Fv_Lss*, variable fluorescence in the steady state; *Fv_Ln*, variable fluorescence during light adaptation; *Fv'/Fm'*, the trapping efficiency of PSII; *Fs/Fo*, steady-state of chlorophyll fluorescence yield normalized to the minimal fluorescence yield; *NPQ*, instantaneous non-photochemical quenching relaxation; *Fv/Fm*, *(Fm – Fo) /Fm*, the maximum PSII quantum yield; *NPQ_Ln*, *(Fm -Fm_Ln)/Fm_Ln*, instantaneous non-photochemical quenching in light; *NPQ_Lss*, *(Fm -Fm_Lss)/Fm_Lss*, steady-state non-photochemical quenching; *qL*, *(Fq/Fv)/(Fo/Ft)*, coefficient of photochemical quenching measured the fraction of open PSII centers based on a 'lake' model for PSII; *qP*, *(Fm-Ft)/(Fm-Fo)*, coefficient of photochemical quenching; *QY*, *(Fm-Ft)/Fm*, instantaneous PSII quantum yield; *Rfd_Ln*, *(Fp-Ft_Ln)/Ft_Ln*, instantaneous fluorescence decline ratio in light; *qN_Dn*, *(Fm-Fm_Dn)/(Fm-Fo_Dn)*, coefficient of non-photochemical quenching during dark relaxation; *qN_Ln*, *(Fm-Fm_Ln)/ (Fm-Fo_Ln)*, coefficient of non-photochemical quenching during light adaptation; *qL_Ln*, *(Fm_Ln-Ft_Ln)/(Fm_Ln-Fo_Ln)*, coefficient of photochemical quenching during light adaptation; *qL_Lss*, *(Fm_Lss-Ft_Lss)/(Fm_Lss-Fo_Lss)*, coefficient of photochemical quenching in steady-state; *ΦPSII_Lss*, *(Fm_Lss - Ft_Lss)/Fm_Lss*, steady-state PSII quantum yield; *ΦPSII_Ln*, *(Fm_Ln - Ft_Ln) /Fm_Ln*, PSII quantum yield in light.