ALPHA AND QUANTUM YIELDS OF MACROALGAE DERIVED FROM PAM FLUOROMETRY: USES AND MISUSES

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The slope of the initial linear range of a photosynthesis-irradiance (P-I) curve, alpha (α), is frequently, but often incorrectly, used to denote the maximal quantum yield (or the "efficiency" of photosynthesis) of higher plants and macroalgae under the conditions for which the P-I curve was measured. When using the increasingly popular method of pulse amplitude modulated (PAM) fluorometry, the determination of α from so-called rapid light curves (RLC) may lead to misinterpretations when comparing photosynthetic efficiencies under different environmental conditions. Furthermore, since PAM fluorometry measures the quantum yield (Y) directly, there may be no need to use α as its estimate. We compared photosynthetic parameters derived from RLCs of *Ulva* sp. measured during winter and summer, and show large differences in α when electron transport rates (ETR) were plotted against incident irradiance (I_i) [α = 0.26±0.00 vs. 0.08±0.01 during the winter (November-December) and summer (July-August), respectively], as is usually done. On the other hand, no differences in the initial slopes of the RLCs were apparent when plotting ETR vs. the absorbed irradiance (I_a) (initial slope = 0.75±0.01 vs. 0.62±0.12 during the winter and summer, respectively); this is called for since also ETR is calculated using I_a. Using the I_a based RLCs, it was also found that the values of the initial slopes equalled those of the first Y value measurements of the RLCs (Y_0) (t-test $p>0.05$, $r^2=0.85$).. Therefore, when using PAM fluorometry, we suggest a) to present the x-axis of RLCs as I_a (I_i*AF*0.5) and ETR on the y-axis as $Y*I_a$, and b) that Y_0 be taken as a correct measure of the maximal quantum yield instead of estimating it from an RLC.

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