Productivity estimated as in vivo chlorophyll *a* fluorescence and biochemical composition in *Chlorella fusca* (Chlorophyta) grown in outdoor thin-layer cascades

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The photosynthetic performance by using *in vivo* chlorophyll *a* florescence, biomass composition and productivity of three cultures of *Chlorella fusca* (Chlorophyta) grown in thin-layer cascades (TLCs) in different locations and time of the year were evaluated. Biomass productivity was higher in 120 m^{-1} S/V TLC (3.65 g L^{-1} d^{-1}) compared at 27 m^{-1} S/V TLC (0.08-0.15 g L^{-1} d^{-1}). Online monitoring of *in vivo* chlorophyll fluorescence provided data with high temporal resolution. The simultaneous measure of the PAR irradiance and the effective quantum yield together to the determination of absorption coefficient allowed the determination of daily Electron transport rate (ETR), what led to the estimation of biomass productivity by using conversion factors of mol photons per oxygen produced and relation between carbon assimilated and oxygen produced. The relation between estimated productivity and measured productivity estimated as g l^{-1} d^{-1} was 0.90 with R^2=0.94.

Final biochemical composition was similar in summer culture independent of the S/V of the TLC i.e 30-37% DW lipids, 30-34 % DW proteins and 16-19% DW starch. Lower accumulation was found in autumn cultures, ~23, 28% and 13% DW for lipid and starch content, respectively. The S/V ratio of the system was a key factor to obtain high biomass and storage product productivity. This strain was able to grow outdoors in TLC, exhibiting very high productivity according to the optimal photosynthetic performance and accumulating high lipid and protein content. It is shown as first time a good estimation of algal biomass productivity by using daily integrated values of electron transport rate (ETR) converted to estimated biomass productivity.

Key Word: Biomass productivity, *Chlorella fusca*, Electron transport rate, *In vivo* chlorophyll *a* fluorescence, Thin-layer cascades

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