



Consiglio Nazionale delle Ricerche

Biological constraints in algal biotechnology (Panel discussion)

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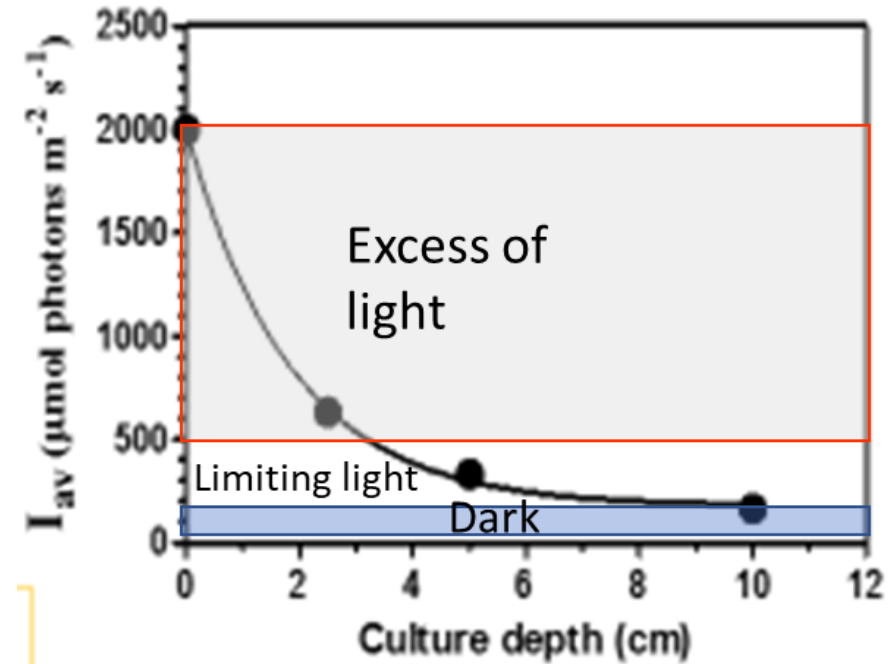
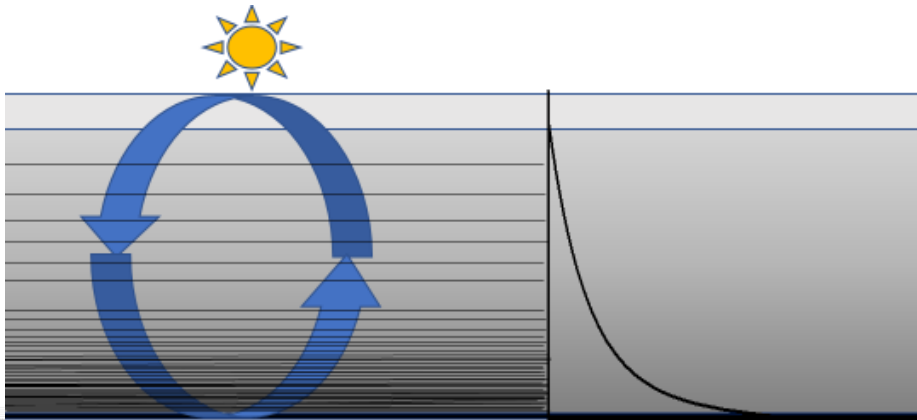


Summary of expected the energy losses of total incident solar radiation energy in outdoor microalgal cultures.

Process	Energy radiation losses (%)	Remaining energy (%)
Total solar radiation	-	100
Reflection/scattering	10	90
Radiation outside PAR	55	41
Loss of useful absorbed PAR energy at 680 nm (PSII) and 700 nm (PSI)* due to non-photochemical processes	20 (*)	32.8
Conversion energy to biomass	71.3	9.4
Photosynthesis saturation and photoinhibition	80 (**)	1.88
Night loss	20	1.5
Temperature (suboptimal)	23	1.155
Oxygen saturation	30	0.808
Total biomass /ha/year (19 MJ/m ² /day)	≈ 28-30 (< 10 g/m²/day)	

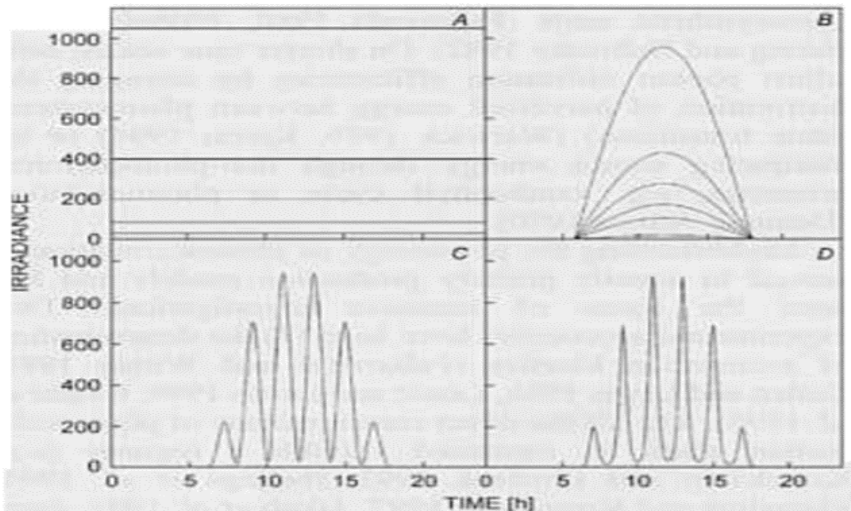
Photoacclimation under fluctuating light irradiance

Under fluctuating light irradiance of low and medium frequency like that prevailing in dense microalgal cultures, cells acclimate to irradiances which are approximately 3 times lower than the average irradiance of the fluctuating regime.



Photoacclimation of *Dunaliella tertiolecta* (Chlorophyceae) under fluctuating irradiance H. HA VELKOV Á-DOUŠOV Á . O. PRÁŠIL , M.J. BEHRENFELD

PHOTOSYNTHETICA 42
(2): 273-281, 2004



Strategies for improving biomass output rate

Challenges for implementation

Possible workarounds

O₂ inhibition of photosynthesis

Create O₂ tolerant species

Low light conversion efficiency due to light saturation

**1) Create species with high-saturation level of photosynthesis .
2) Reduce antenna size.**

Low productivity due to sensitivity to extreme temperatures

Select strains resistant to high and low temperatures.

Susceptibility to pollution

Create species growing under selective environmental (medium) conditions.