



Centro interdipartimentale di ricerca  
«CENTRO STUDI DI ECONOMIA E TECNICA DELL'ENERGIA  
GIORGIO LEVI CASES»

PROGETTO DOTTORATO DI RICERCA 2014:

# “Miglioramento genetico di alghe unicellulari per la produzione di biocombustibili”

AGGIORNAMENTO DOPO IL PRIMO SEMESTRE

Giovedì 14 maggio 2015

---

Supervisore: Tomas Morosinotto

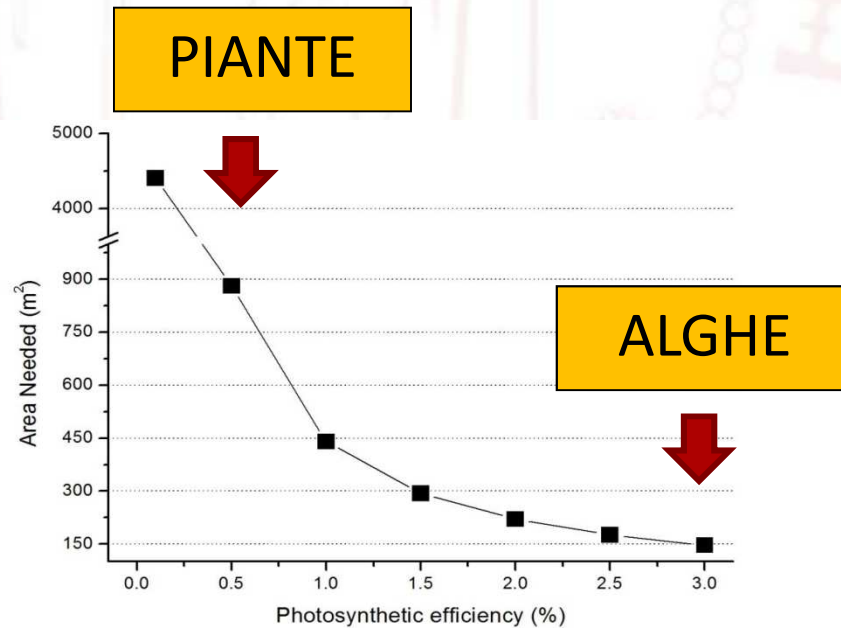
Dottorando: Alessandra Bellan

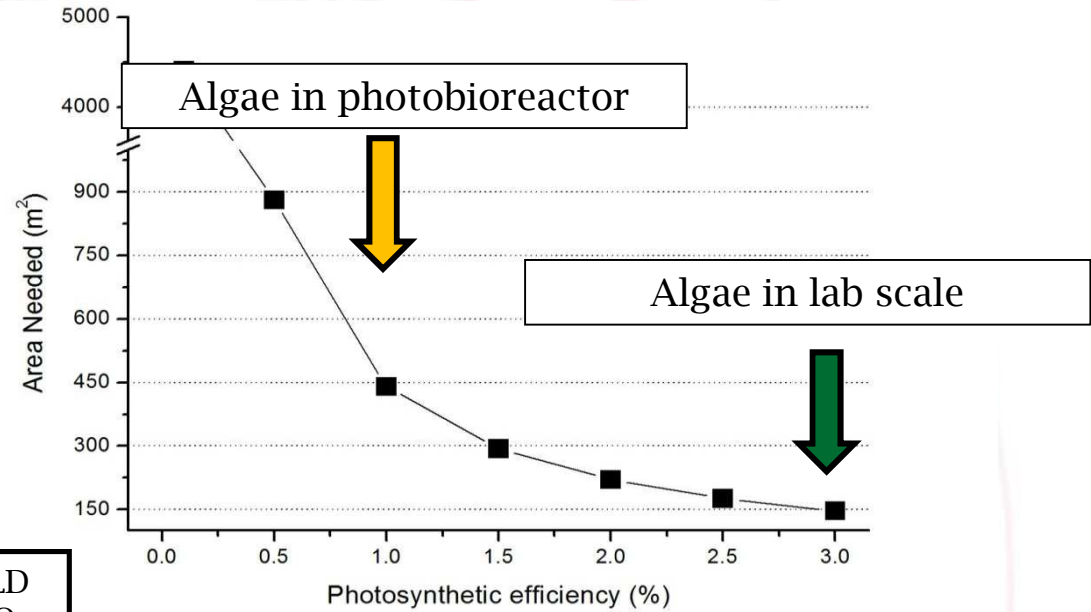
# Algae in biofuels production



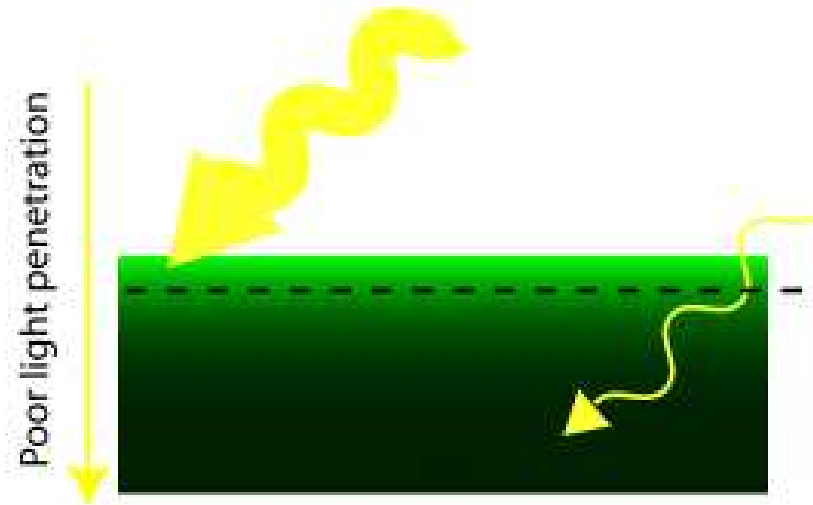
Yield of various plant oils.

Crop	Oil in liters per hectare
<b>Algae</b>	<b>1,00,000</b>
Castor	1413
Coconut	2689
Palm	5950
Safflower	779
Soy	446
Sunflower	952



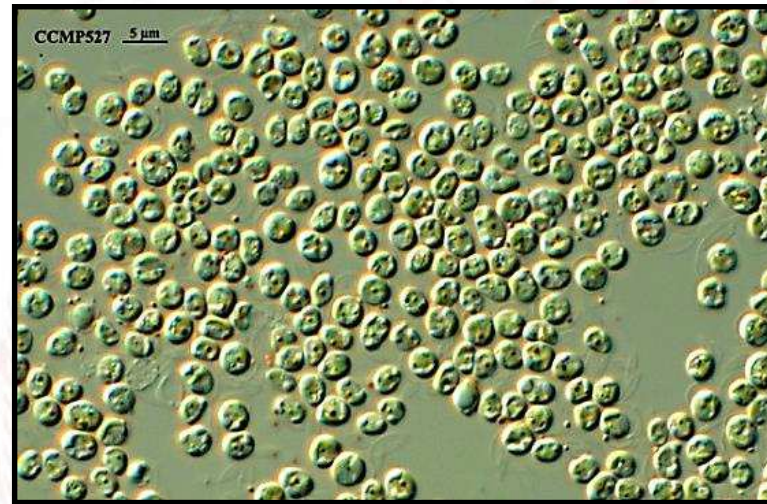


ENGINEERING WILD  
TYPE STRAINS TO  
INCREASE  
PRODUCTIVITY



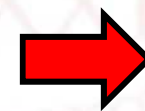
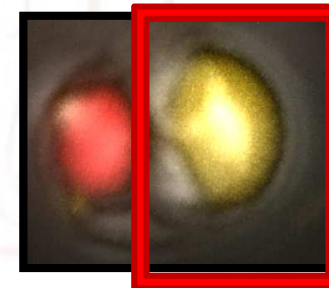
# *Nannochloropsis gaditana*

- High growth rate
- High lipid content



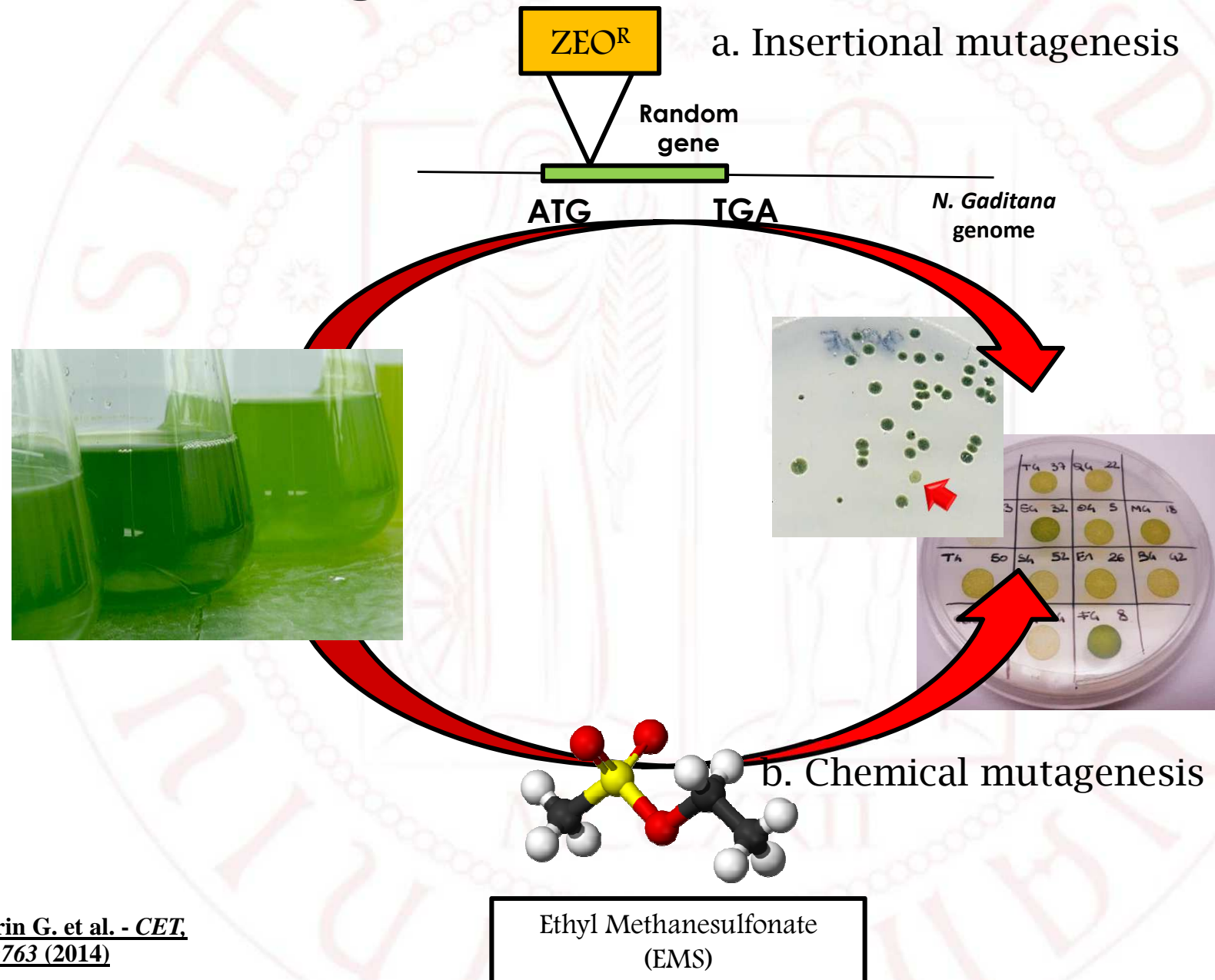
From Provasoli-Guillard National Center for Marine Algae and Microbiota

<u>Microalgae genera</u>	<u>Lipid content (%, w/w DW )</u>	<u>Lipid productivity (mg L<sup>-1</sup>d<sup>-1</sup>)</u>
Botryococcus	25.0–75.0	-
Chlorella	5.0–58.0	11.2–40.0
Dunaliella	17.5–67.0	33.5
Isochrysis	7.1–33.0	37.8
Nannochloris	20.0–56.0	60.9–76.5
<b>Nannochloropsis</b>	<b>22.7–29.7</b>	<b>84.0–142.0</b>

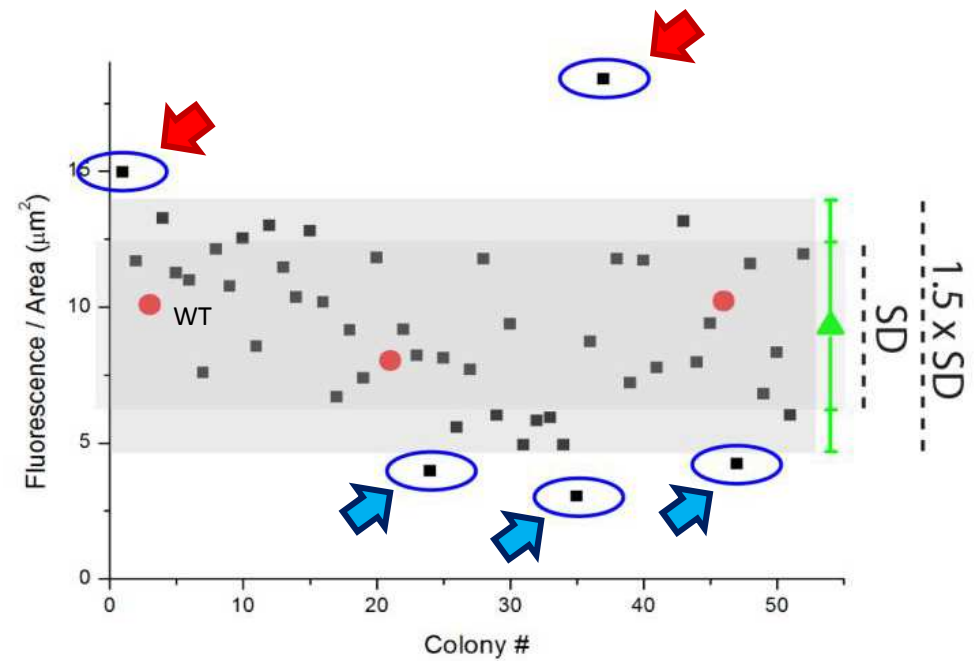
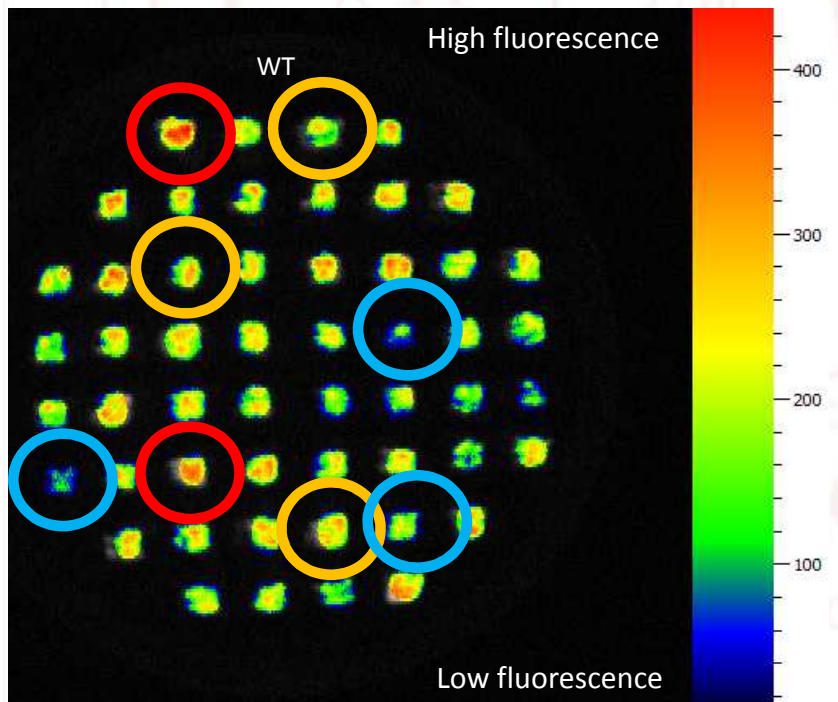
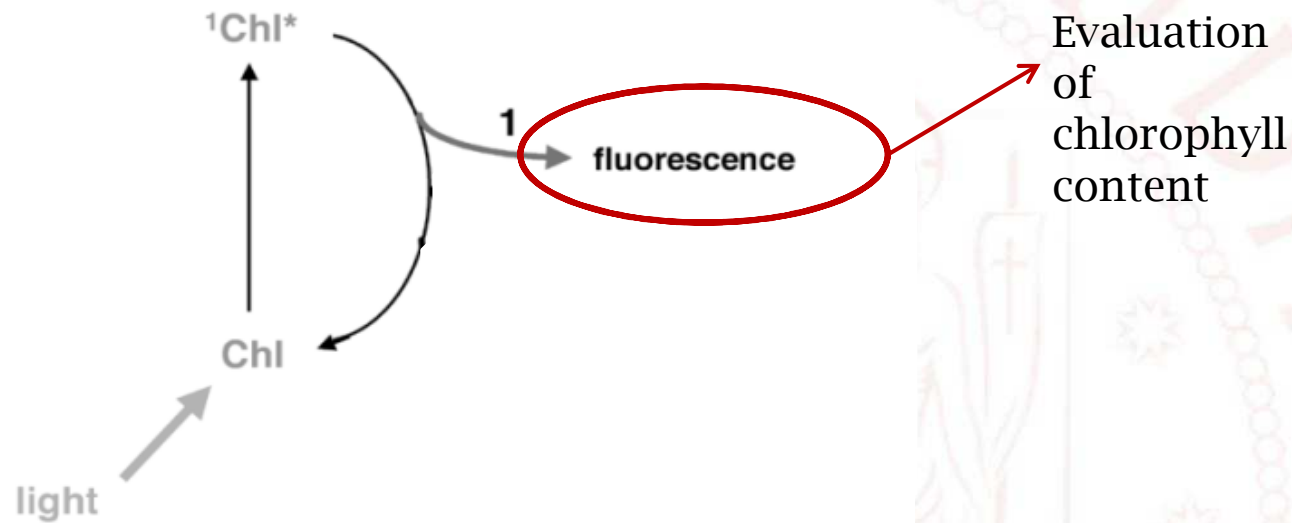


over 60% of its dry weight as lipids in nitrogen starvation

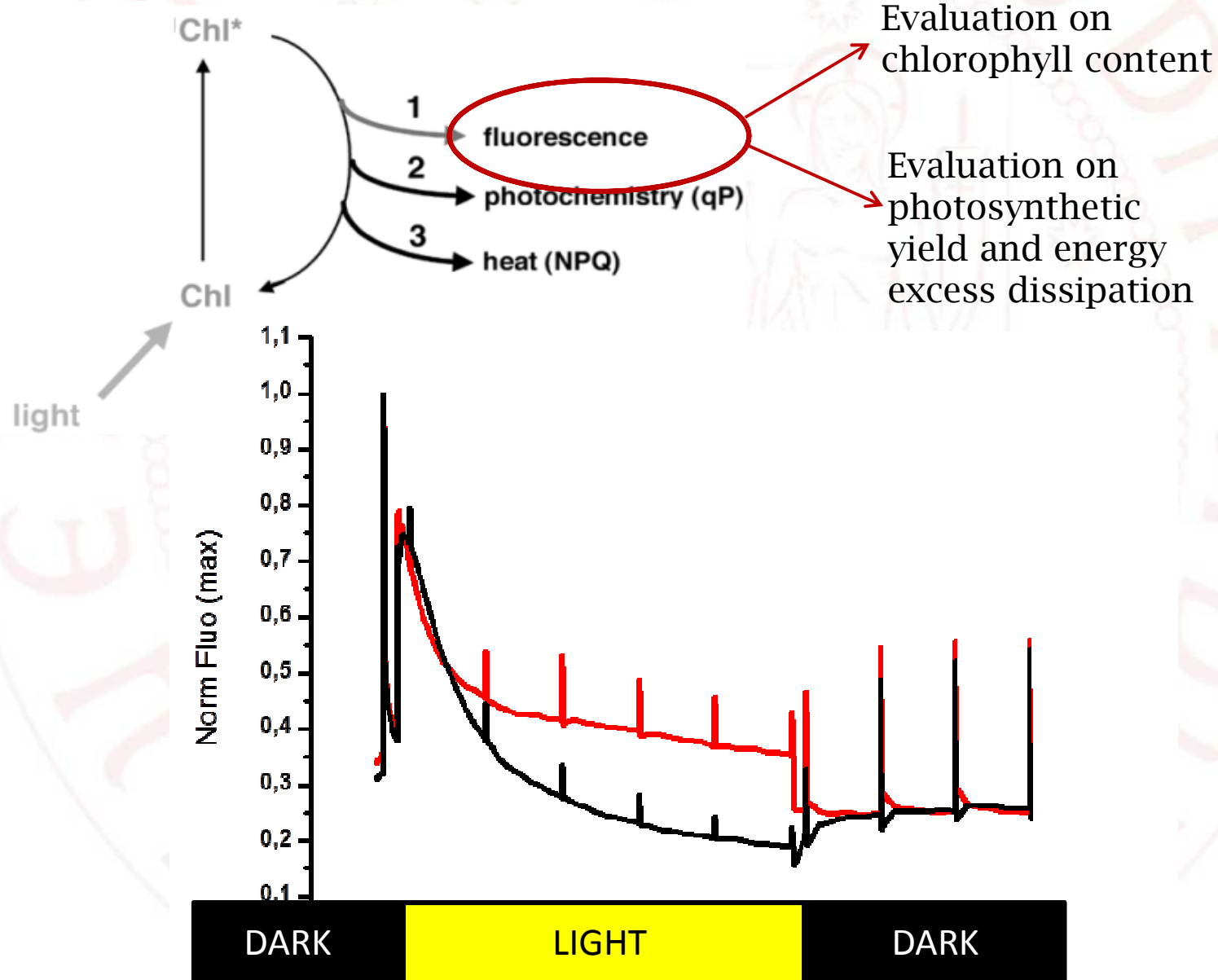
# Mutant strains generation



# The selection process

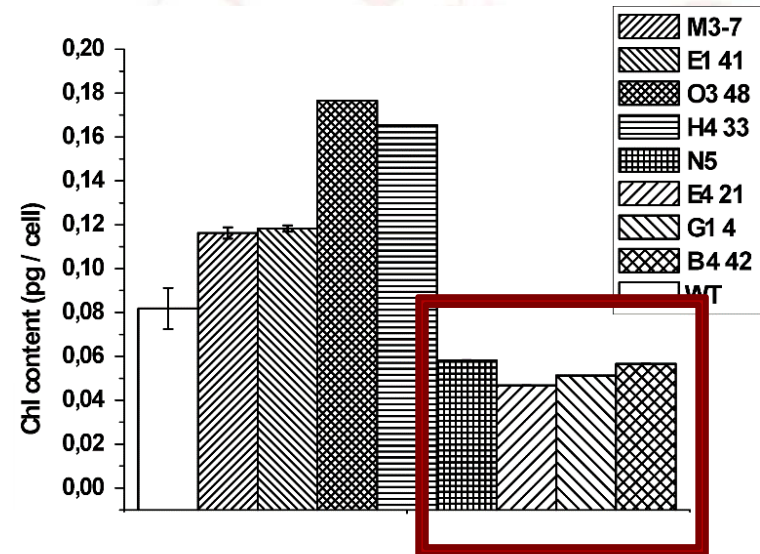


# The selection process



# Examples of strains selected

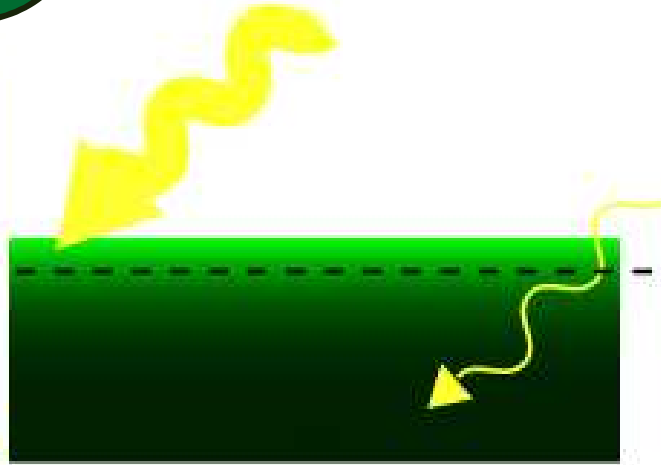
Chlorophyll content





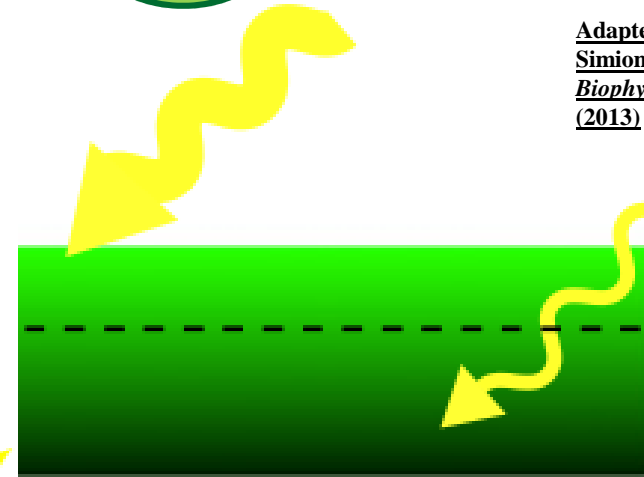
Wild type

Poor light penetration

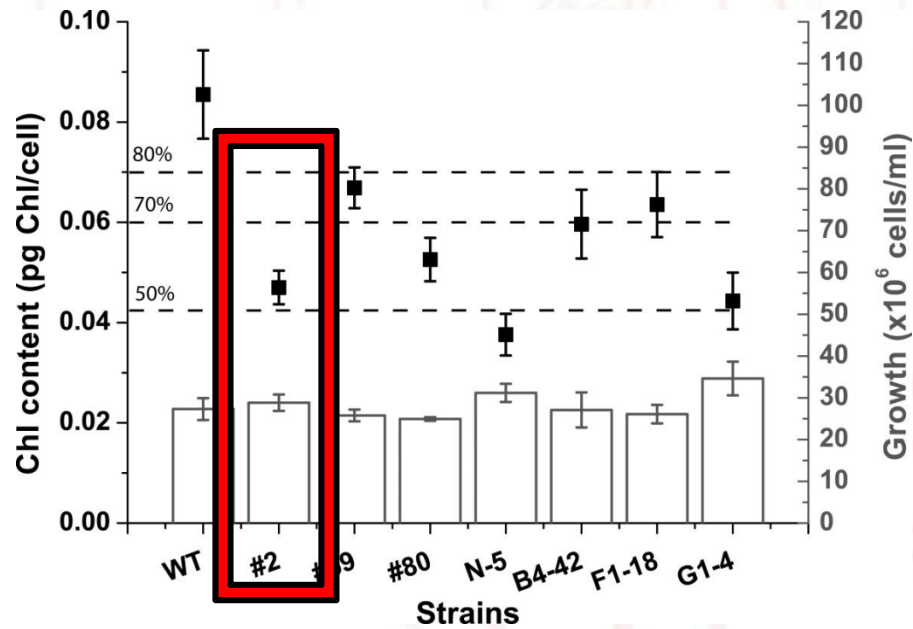


Mutant

Increased light penetration



Adapted from  
 Simionato D. et al. -  
*Biophys. Chem.*  
 (2013)



Strain	Productivity ( $10^6$ cells/ml/d)
WT	$54.3 \pm 8.9^*$
#2	$78.9 \pm 8.2^*$
#69	$53.1 \pm 11.0$
#80	$53.7 \pm 10.2$

# Future prospects

- Productivity evaluation also for the other hypothetical antenna less mutant strains;
- Identification of the number and the position of the insertions in the insertional mutant strains;



**GRAZIE PER L'ATTENZIONE**

---