



Ecotoxicology TP Course

Concepts, Tests & Biomarkers

Bernardo Duarte

Faculty of Sciences of the University of Lisbon
MARE – Marine and Environmental Sciences Centre



TP5 Pigment Profiling II



Control



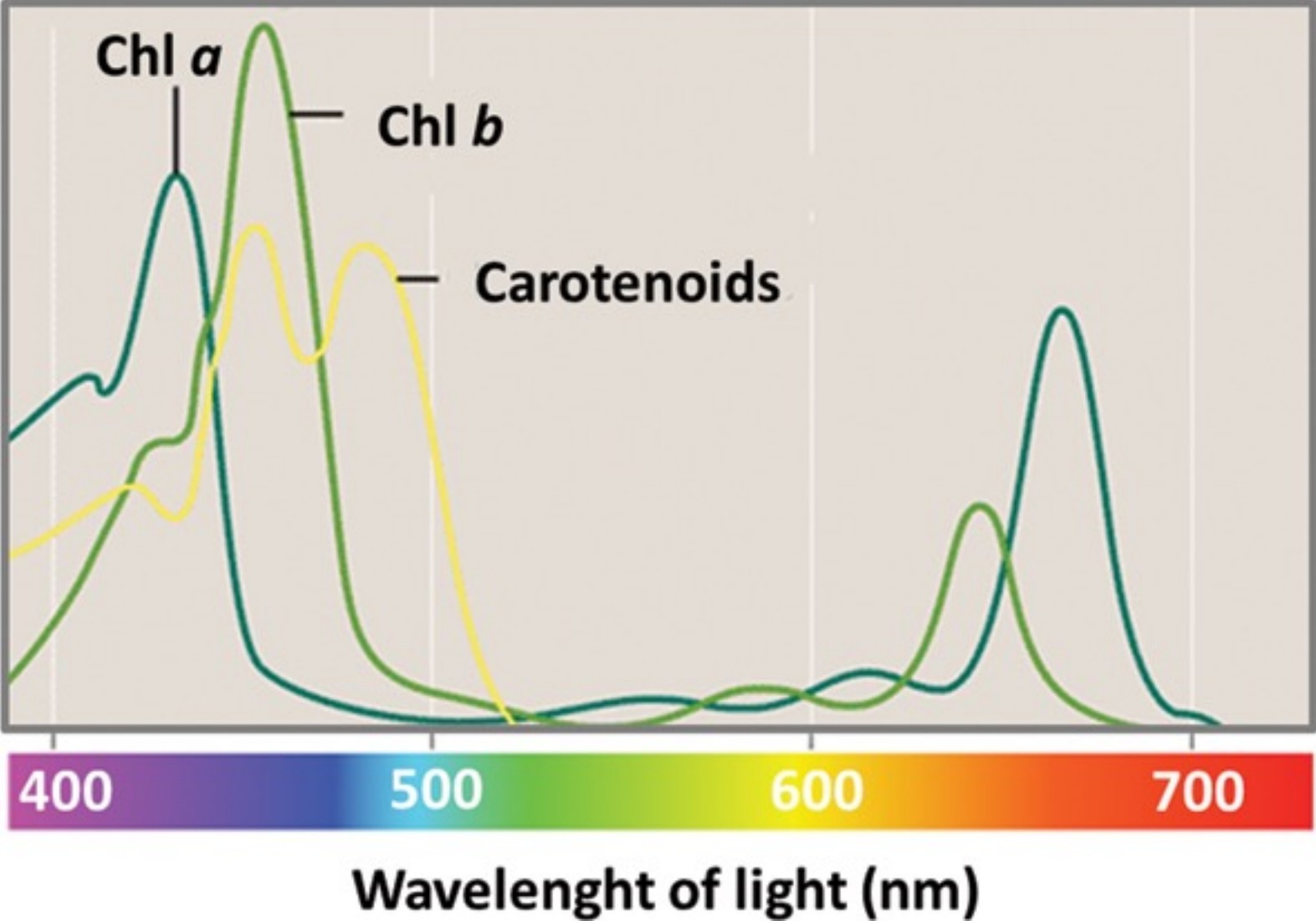
10 ug/L Glifosato



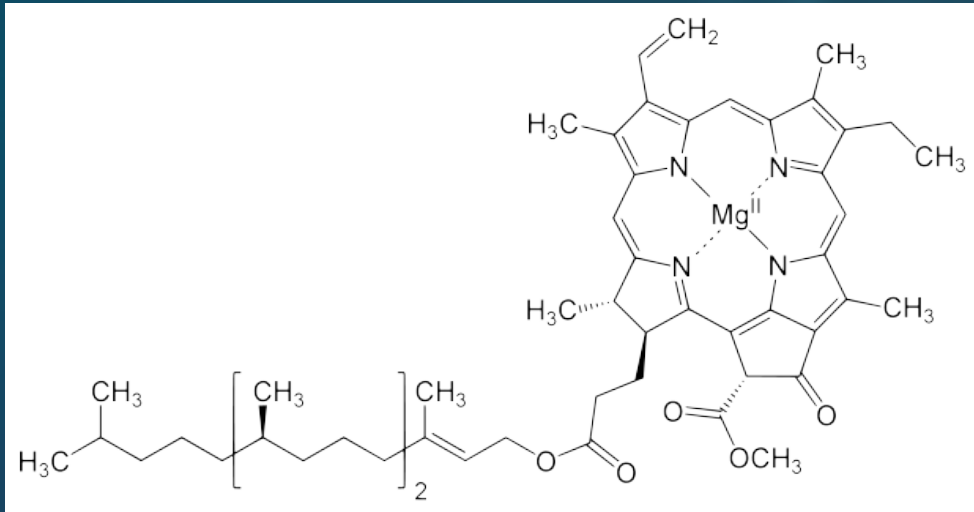
250 ug/L Glifosato



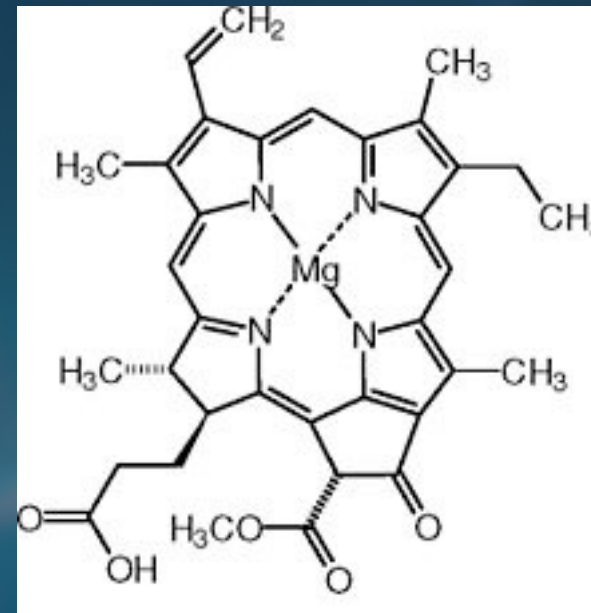
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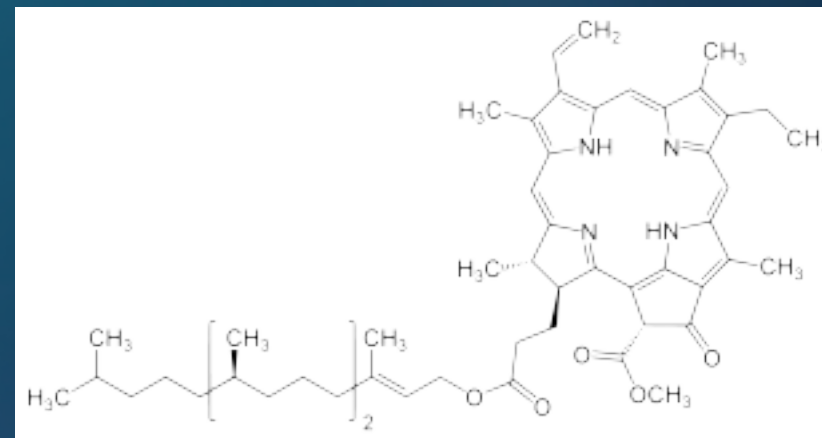
CHLOROPHYLL DEGRADATION PRODUCTS



Chlorophyll a

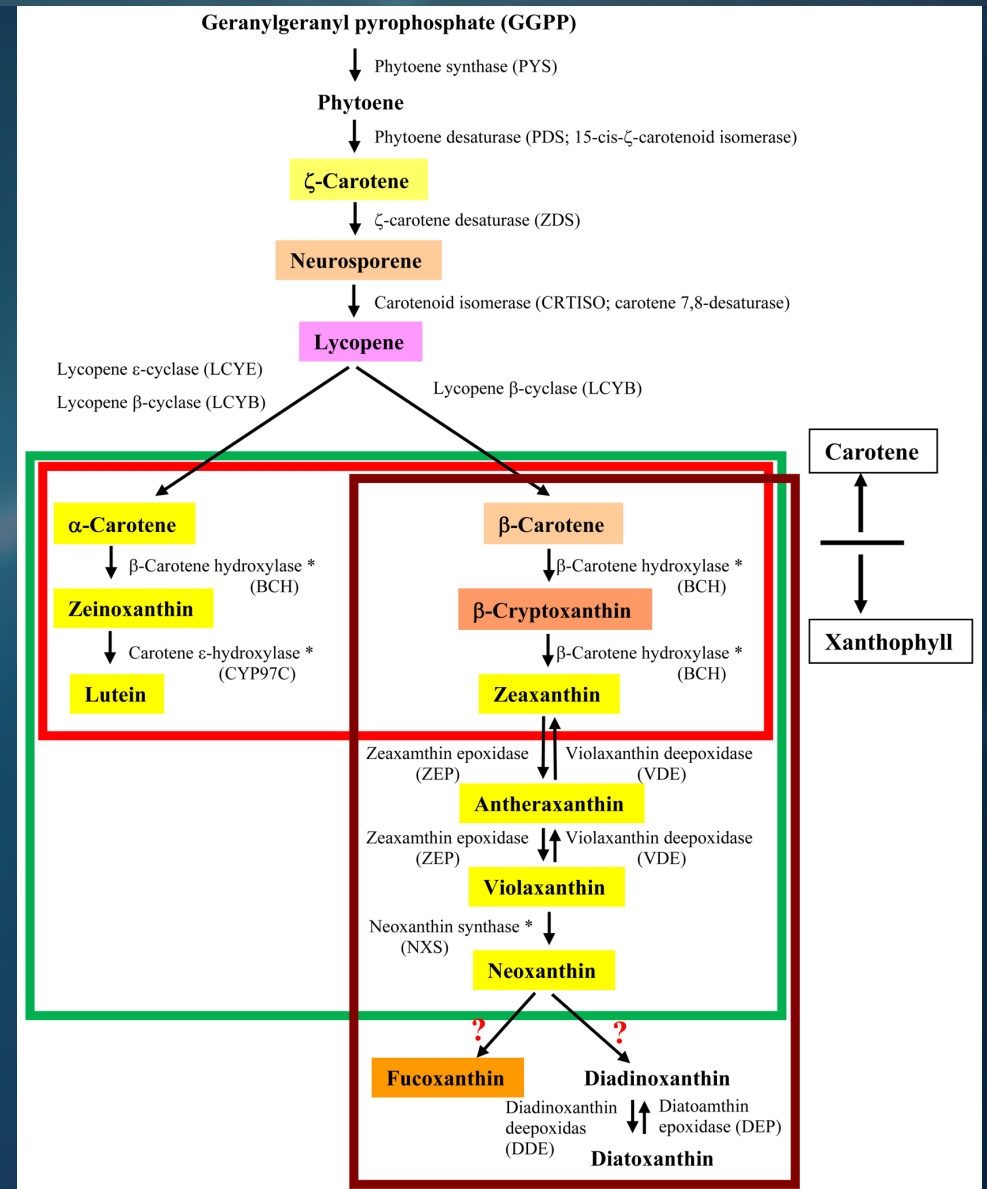
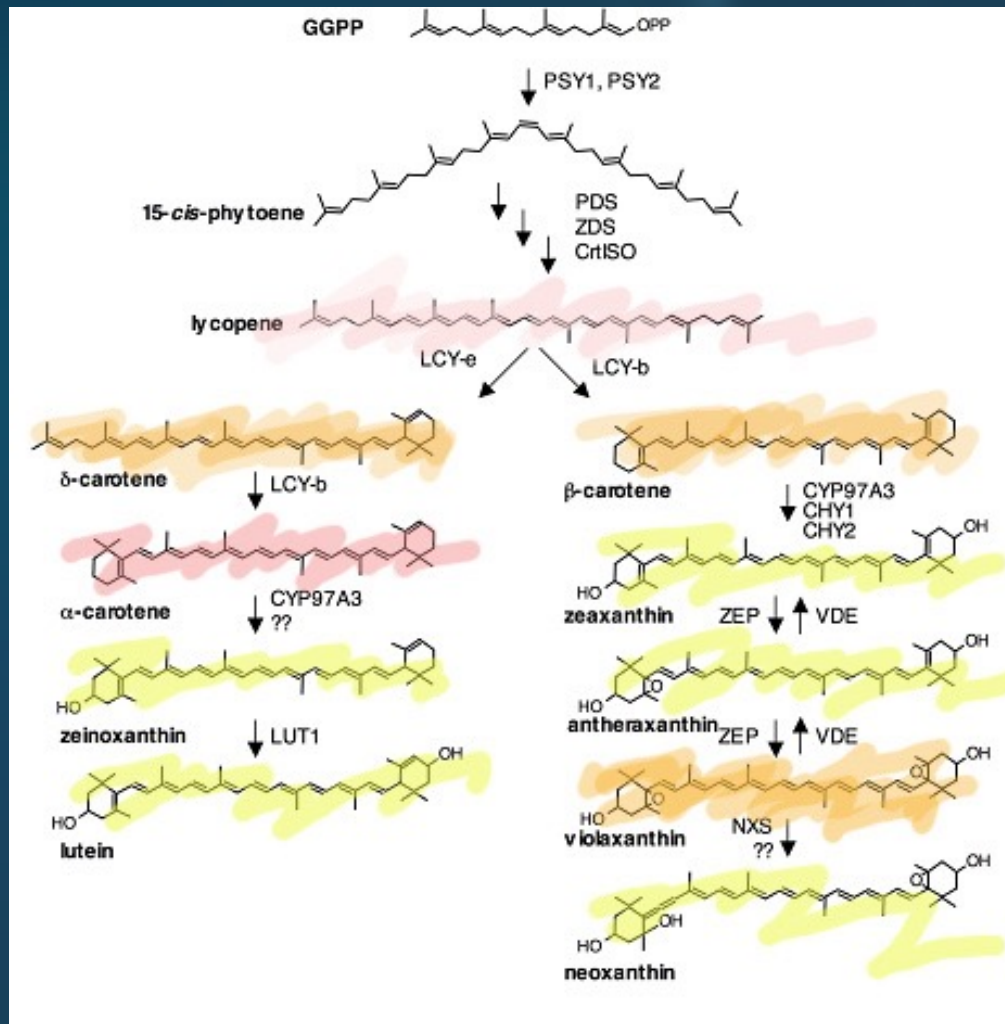


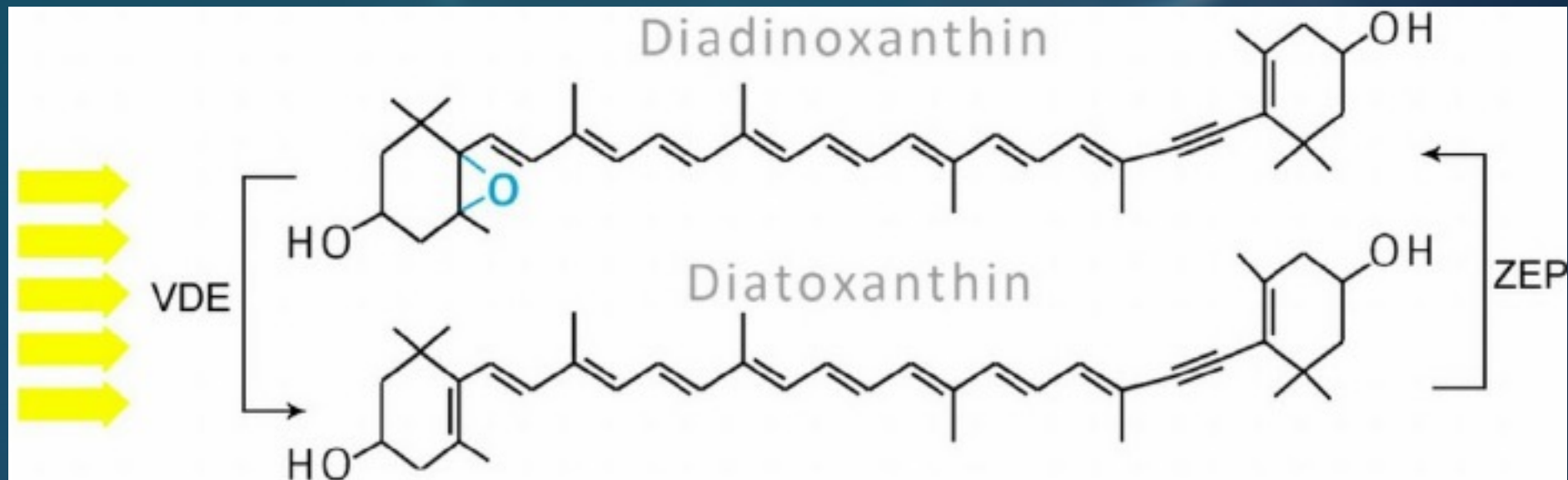
Chlorophyllide a



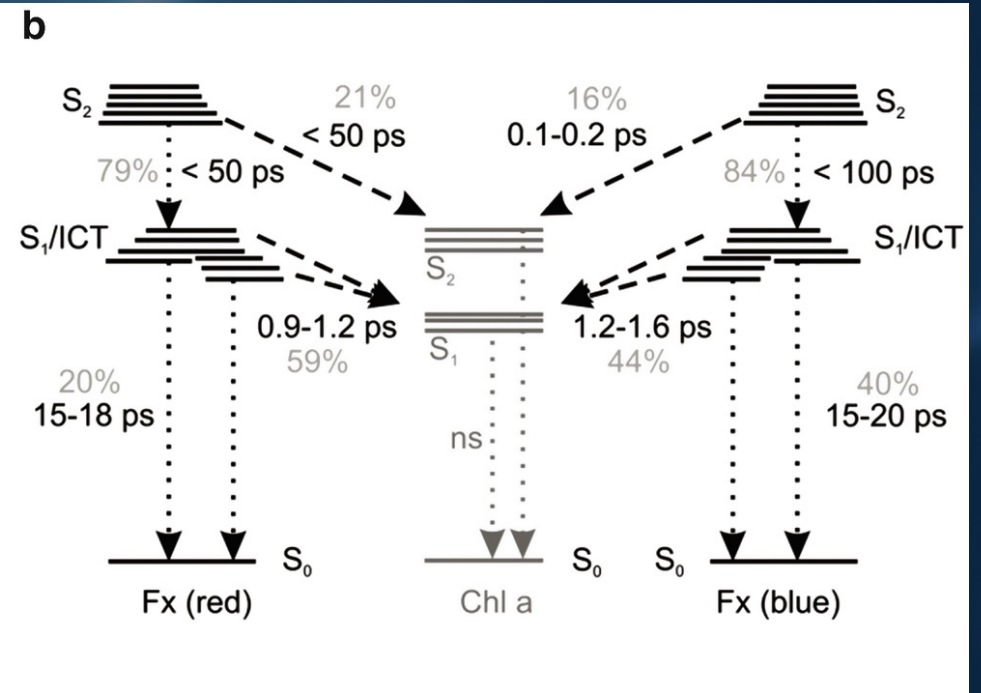
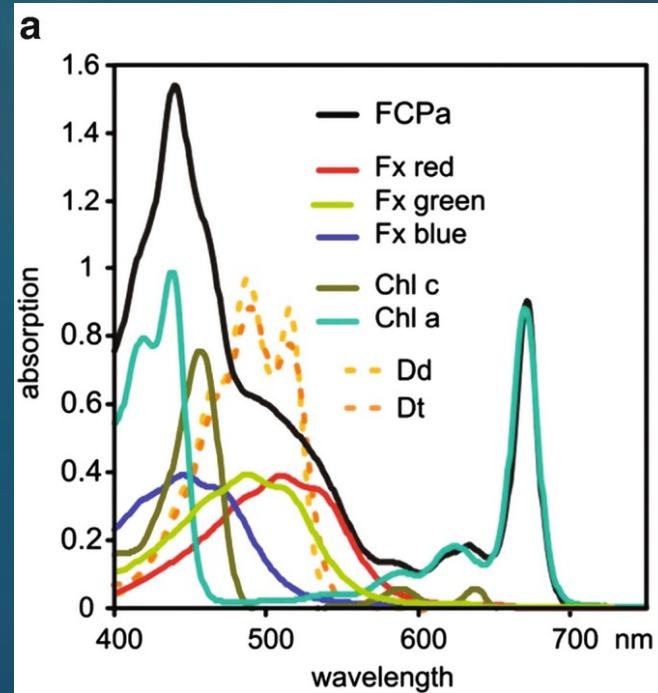
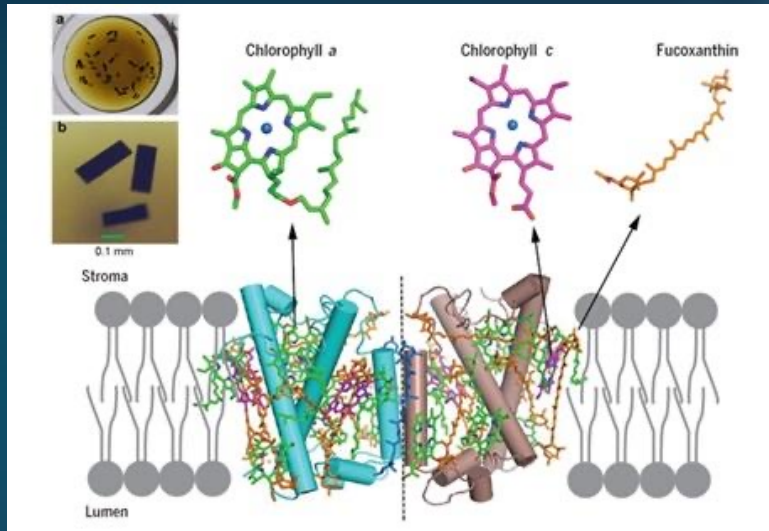
Pheophytin a

CAROTENOIDS





FUCOXANTHIN LIGHT HARVESTING

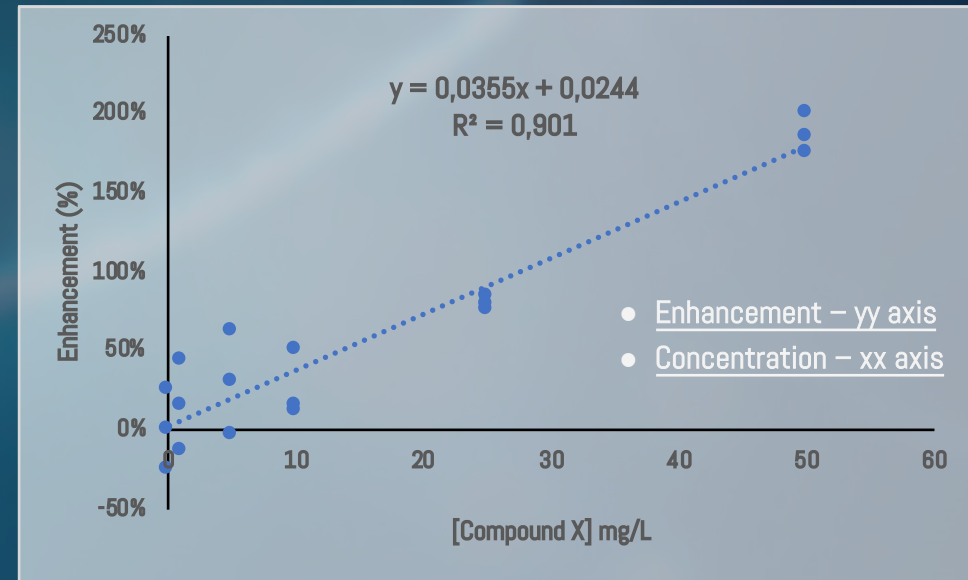


PARAMETERIZATION : Effective Concentration

[Compound X] mg/L	Variable A (a.u.)	Enhancement (%)
0	0,02	0%
0	0,015	-25%
0	0,025	25%
1	0,023	15%
1	0,01725	-14%
1	0,02875	44%
5	0,026	30%
5	0,0195	-3%
5	0,0325	63%
10	0,03	50%
10	0,0225	13%
10	0,023	15%
25	0,035	75%
25	0,037	85%
25	0,036	80%
50	0,06	200%
50	0,057	185%
50	0,055	175%



$$\text{Enhancement (\%)} = \frac{\text{Test} - \overline{\text{Control}}}{\overline{\text{Control}}}$$



Using the linear regression equation calculate the concentration at which the enhancement is 50% (EC_{50})

$$50\% = 0.0355x + 0.0244 \Leftrightarrow 0.5 = 0.0355x + 0.0244 \Leftrightarrow 0.5 - 0.0244 = 0.0355x$$

$$x = 13.40 \text{ mg/L} = EC_{50}$$

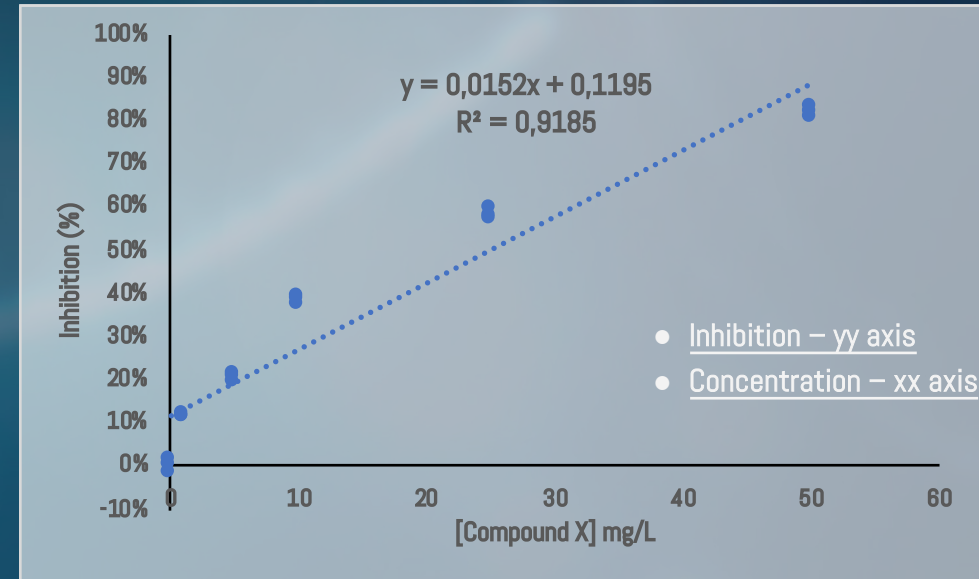
Upon the application of 13.40 mg/L the variable A suffers a 50% increase relative to the control.

PARAMETERIZATION : INHIBITION Concentration

[Compound X] mg/L	Variable A (a.u.)	Inhibition (%)
0	0,02	0%
0	0,015	-25%
0	0,025	25%
1	0,023	15%
1	0,01725	-14%
1	0,02875	44%
5	0,026	30%
5	0,0195	-3%
5	0,0325	63%
10	0,03	50%
10	0,0225	13%
10	0,023	15%
25	0,035	75%
25	0,037	85%
25	0,036	80%
50	0,06	200%
50	0,057	185%
50	0,055	175%



$$\text{Inhibition (\%)} = \frac{\overline{\text{Control}} - \text{Test}}{\overline{\text{Control}}}$$

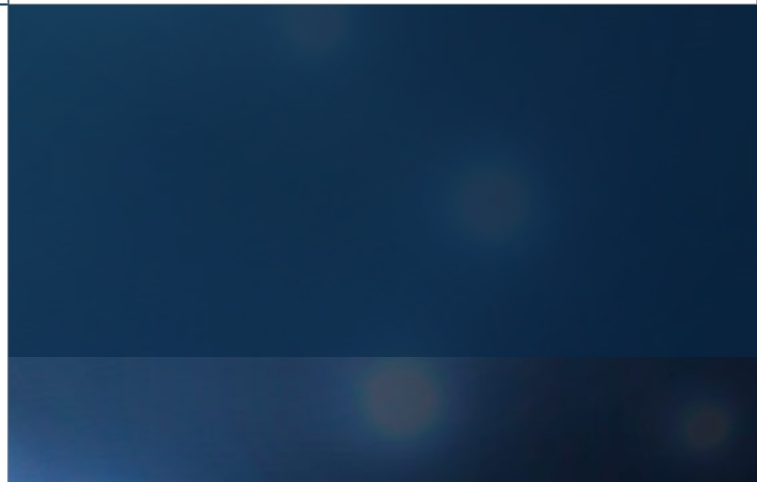
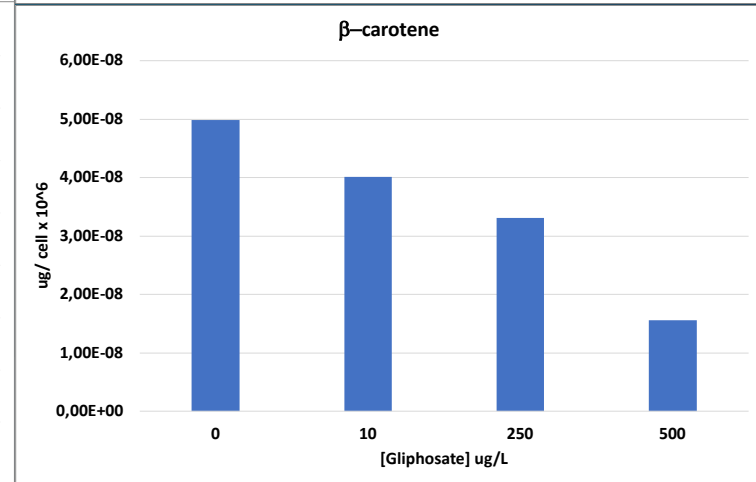
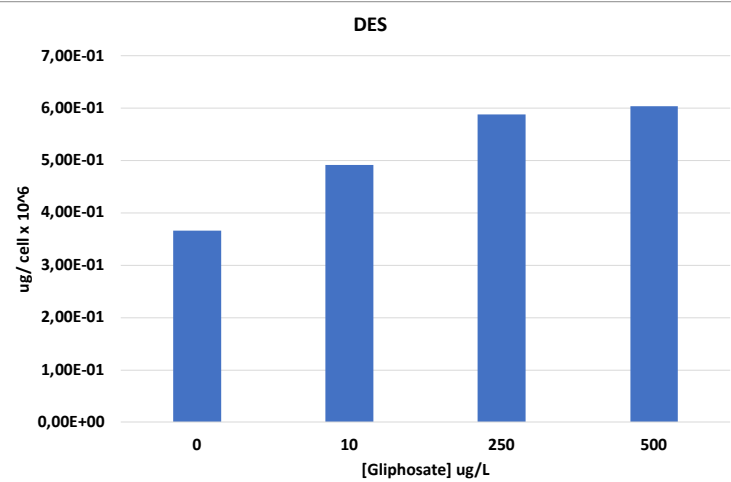
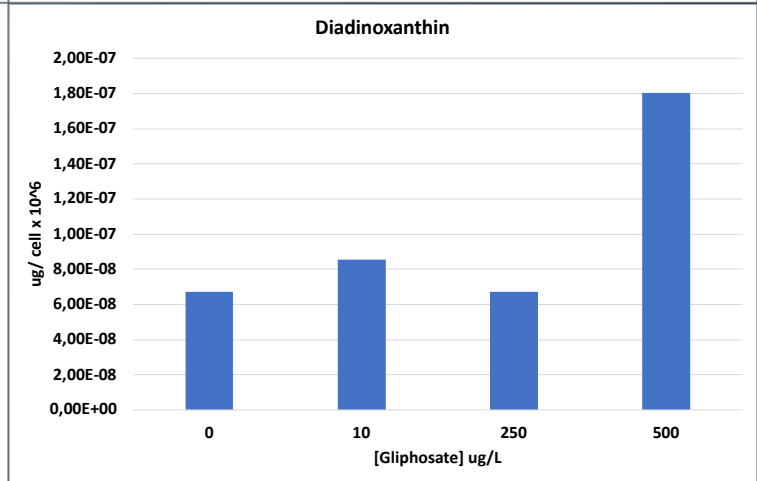
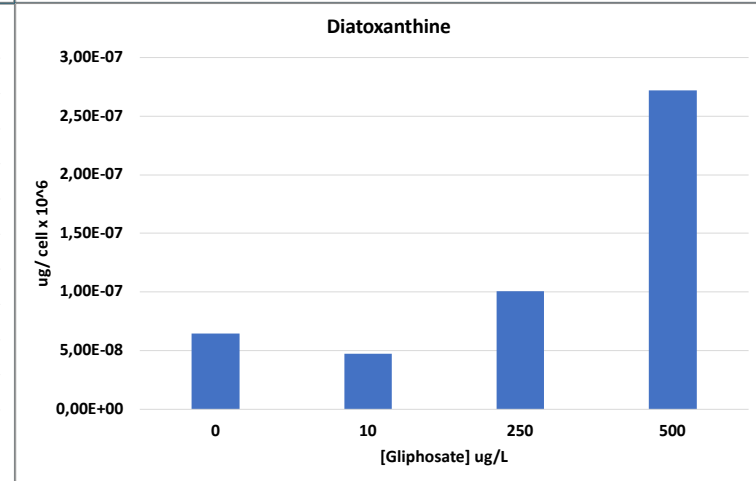
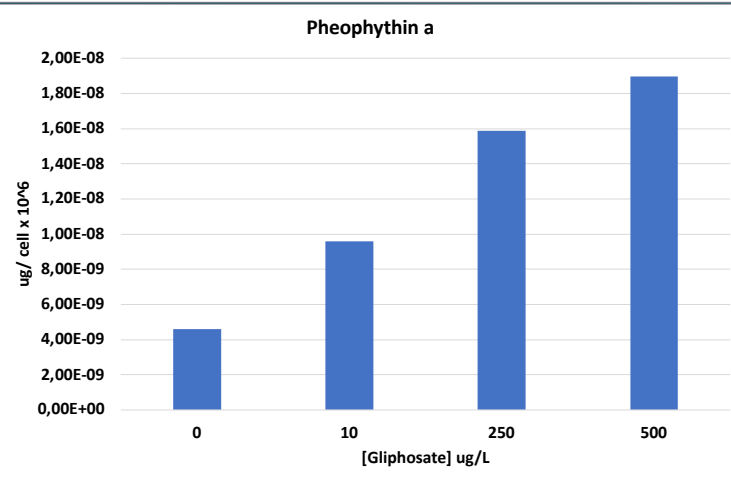
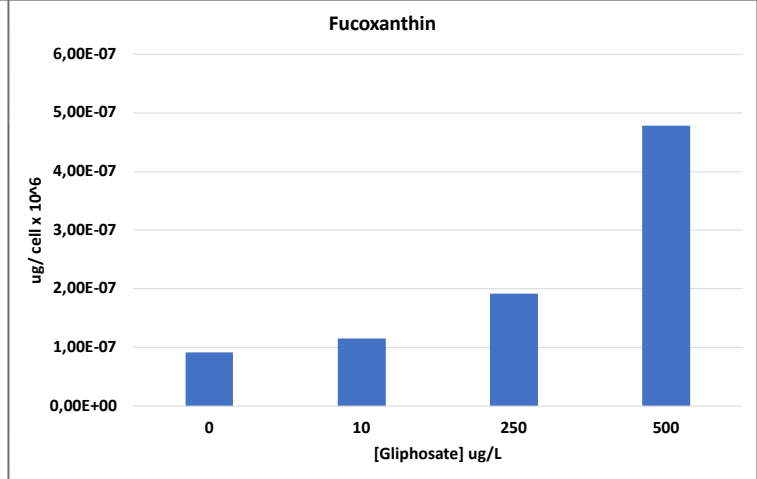
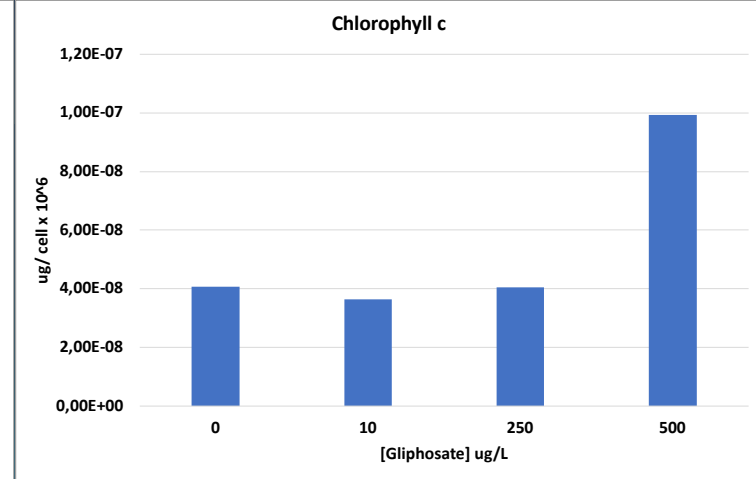
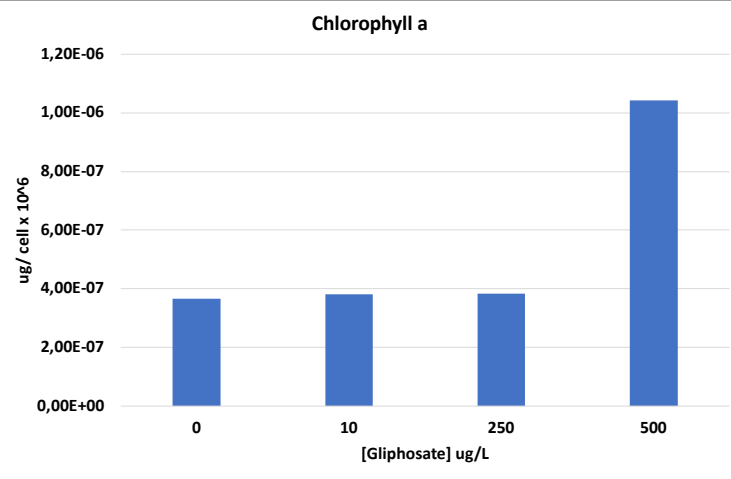


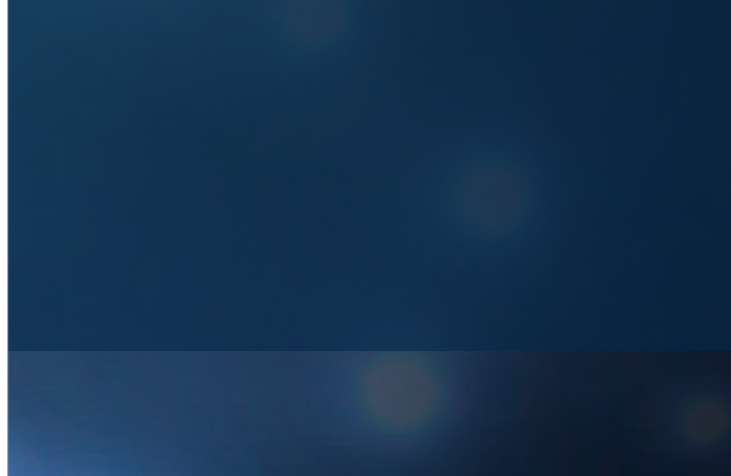
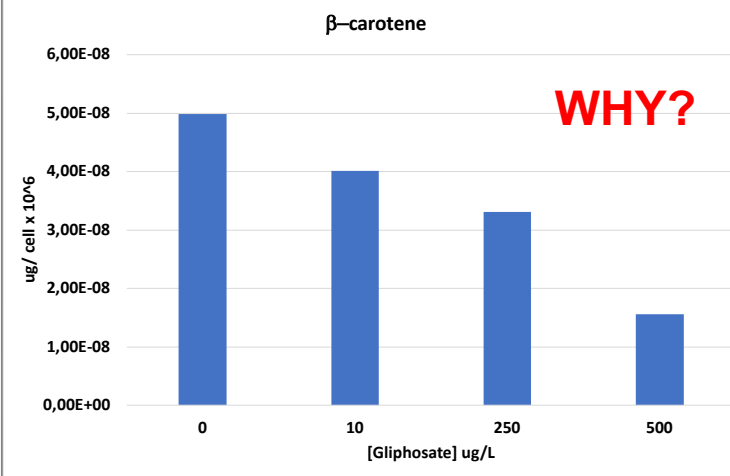
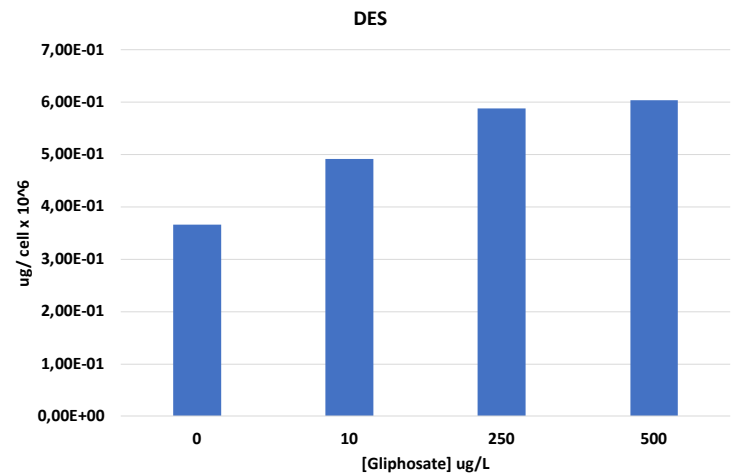
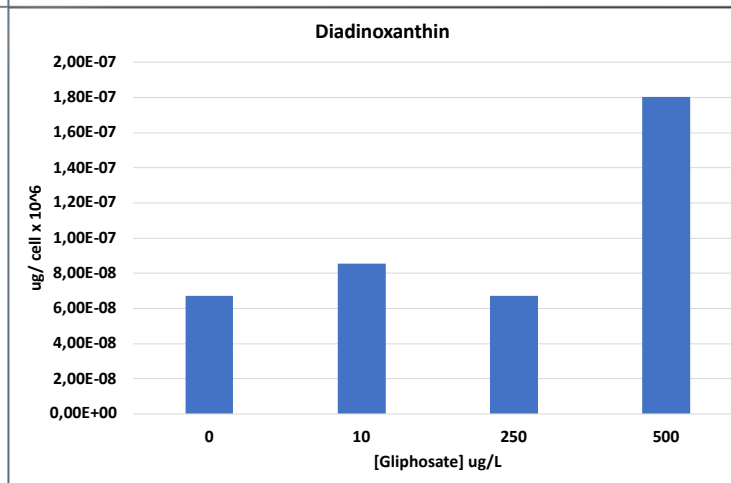
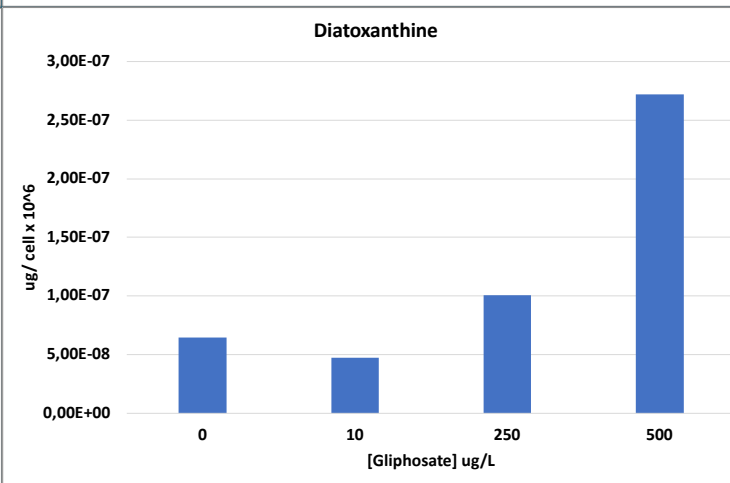
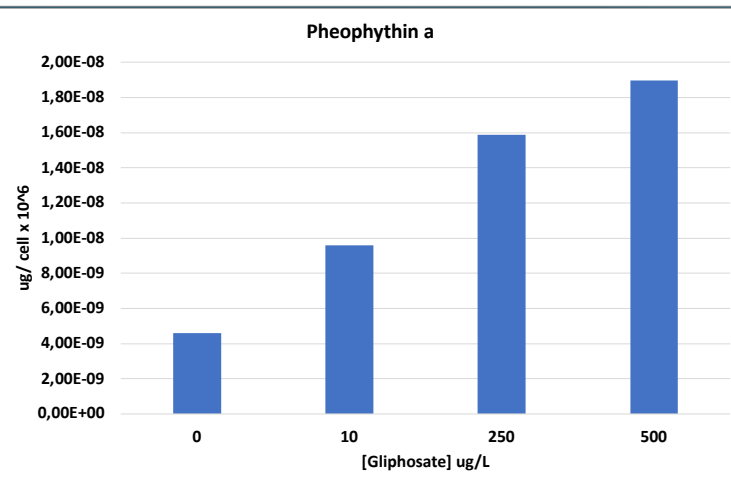
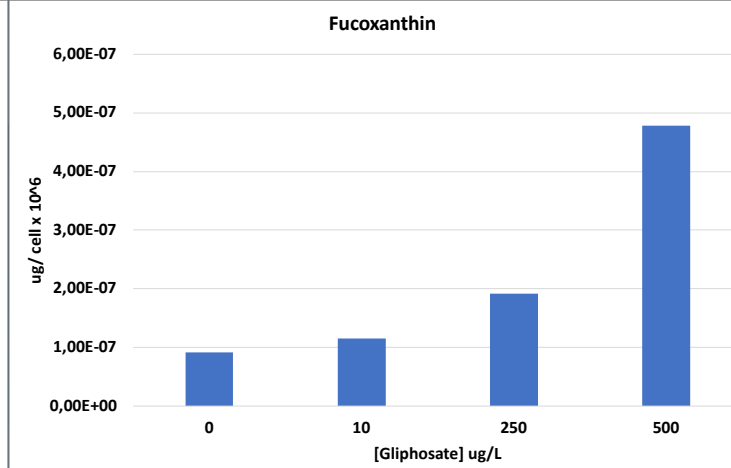
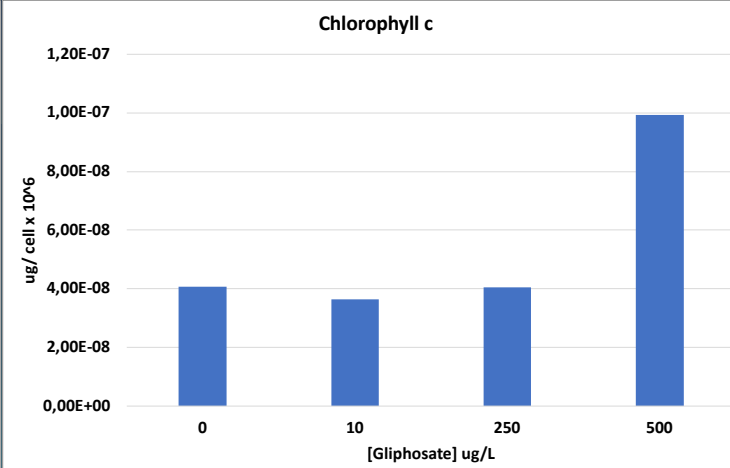
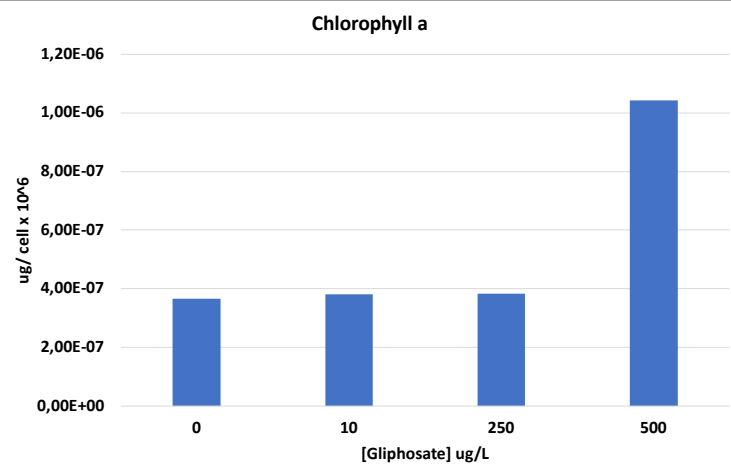
Using the linear regression equation calculate the concentration at which the inhibition was 50% (IC_{50})

$$50\% = 0.0152x + 0.1195 \Leftrightarrow 0.5 = 0.0152x + 0.1195 \Leftrightarrow 0.5 - 0.1195 = 0.0152x$$

$$x = 13.40 \text{ mg/L} = IC_{50}$$

Upon the application of 13.40 mg/L the variable A suffers a 50% inhibition relative to the control.





$$\text{Enhancement (\%)} = \frac{\text{Test} - \overline{\text{Control}}}{\overline{\text{Control}}}$$

$$\text{Inhibition (\%)} = \frac{\overline{\text{Control}} - \text{Test}}{\overline{\text{Control}}}$$

Glyphosate (ug/L)	Chlorophyll a	Chlorophyll c	Pheophythin a	b-carotene	Fucoxanthin	Diadinoxanthin	Diatoxanthine	DES
0	3,6604E-07	4,07E-08	4,6186E-09	4,98728E-08	9,13578E-08	6,70376E-08	6,47158E-08	0,366360052
10	3,81078E-07	3,636E-08	9,5907E-09	4,00951E-08	1,15553E-07	8,55427E-08	4,74155E-08	0,491213561
250	3,82351E-07	4,058E-08	1,5879E-08	3,3074E-08	1,91776E-07	6,72425E-08	1,00403E-07	0,587920567
500	1,04347E-06	9,928E-08	1,8966E-08	1,55927E-08	4,7842E-07	1,80386E-07	2,72232E-07	0,603510104

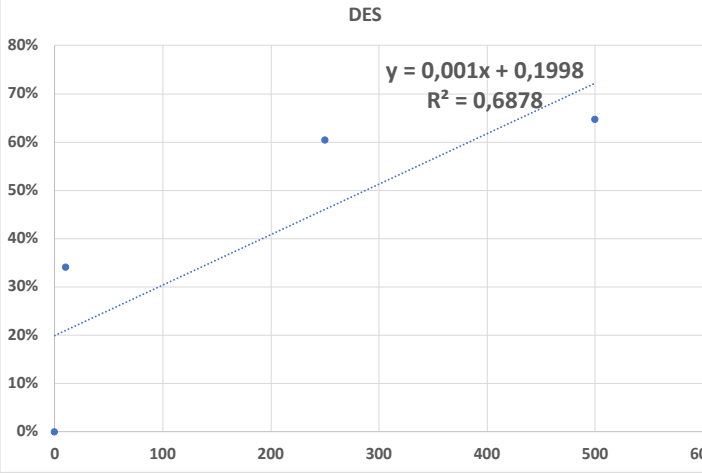
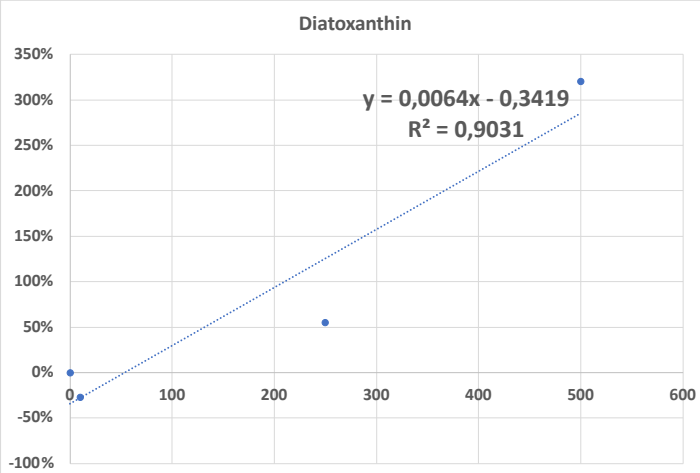
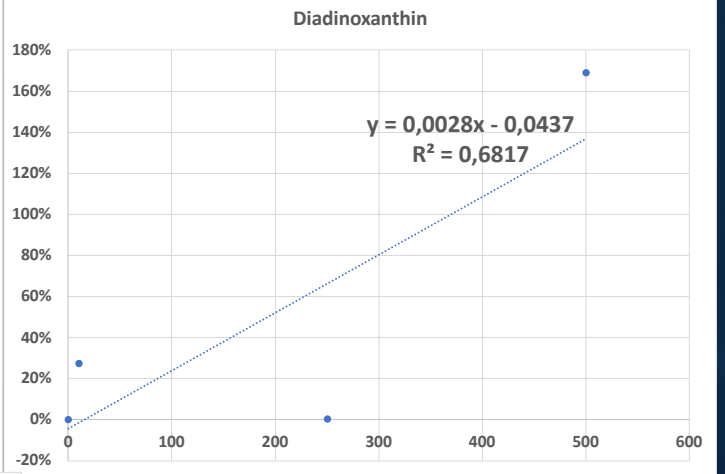
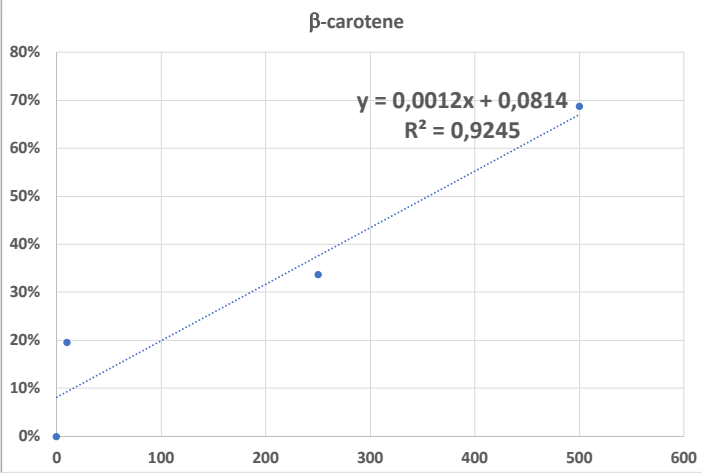
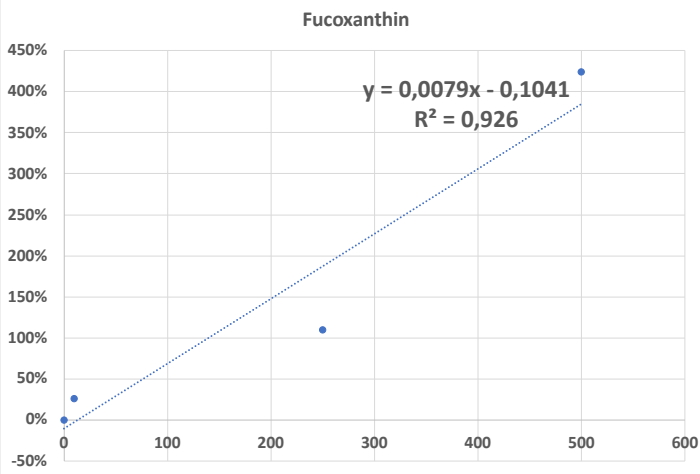
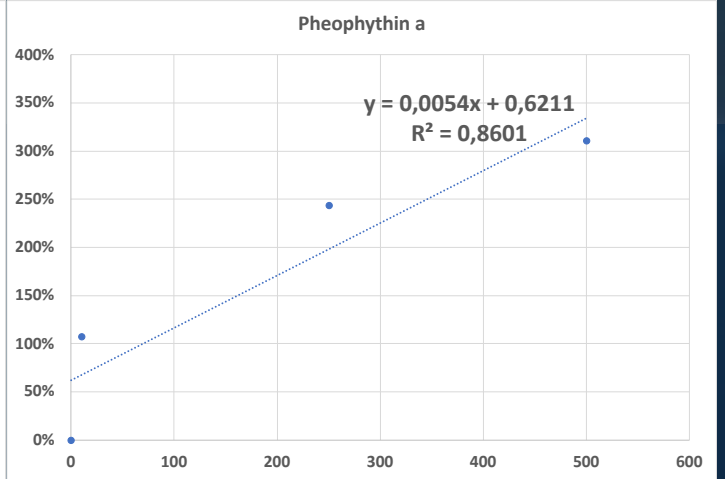
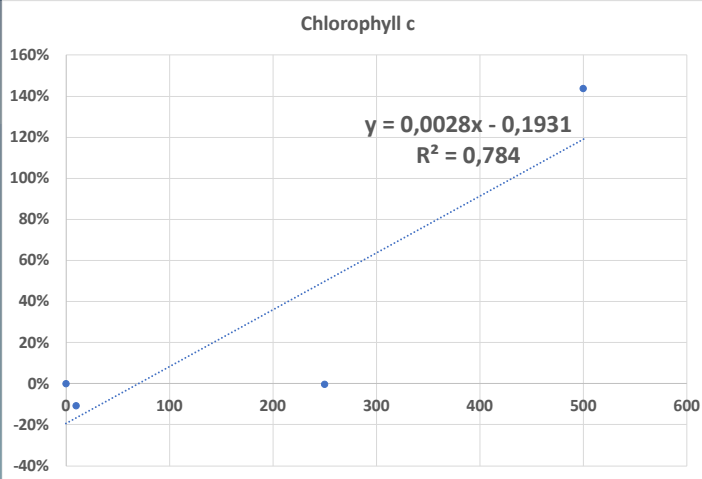
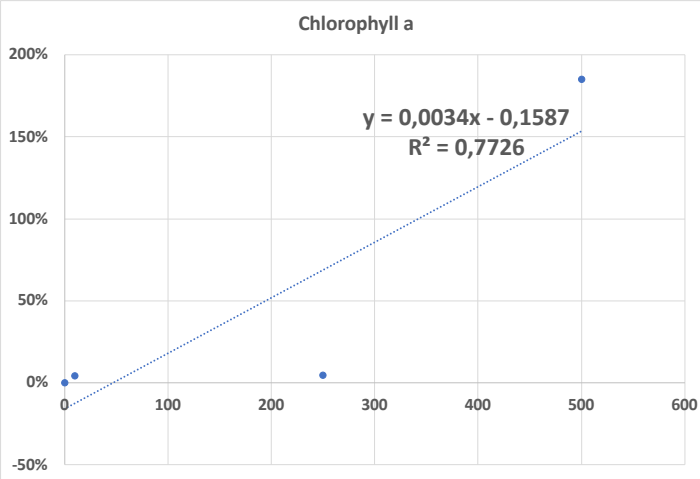
PIGMENT PROFILES

$$\text{Enhancement (\%)} = \frac{\text{Test} - \overline{\text{Control}}}{\overline{\text{Control}}}$$

$$\text{Inhibition (\%)} = \frac{\overline{\text{Control}} - \text{Test}}{\overline{\text{Control}}}$$

Glyphosate (ug/L)	Chlorophyll a	Chlorophyll c	Pheophythin a	β-carotene	Fucoxanthin	Diadinoxanthin	Diatoxanthin	DES
0	3,6604E-07	4,07E-08	4,6186E-09	4,98728E-08	9,13578E-08	6,70376E-08	6,47158E-08	0,366360052
10	3,81078E-07	3,636E-08	9,5907E-09	4,00951E-08	1,15553E-07	8,55427E-08	4,74155E-08	0,491213561
250	3,82351E-07	4,058E-08	1,5879E-08	3,3074E-08	1,91776E-07	6,72425E-08	1,00403E-07	0,587920567
500	1,04347E-06	9,928E-08	1,8966E-08	1,55927E-08	4,7842E-07	1,80386E-07	2,72232E-07	0,603510104

Glyphosate (ug/L)	Chlorophyll a	Chlorophyll c	Pheophythin a	β-carotene	Fucoxanthin	Diadinoxanthin	Diatoxanthin	DES
0	0%	0%	0%	0%	0%	0%	0%	0%
10	4%	-11%	108%	20%	26%	28%	-27%	34%
250	4%	0%	244%	34%	110%	0%	55%	60%
500	185%	144%	311%	69%	424%	169%	321%	65%



Pigment	Equation	R ²	EC ₅₀ or IC ₅₀
Chlorophyll a	$y = 0,0034x - 0,1587$	0,7726	?
Chlorophyll c	$y = 0,0028x - 0,1931$	0,7840	?
Pheophythin a	$y = 0,0054x + 0,6211$	0,8601	?
Fucoxanthin	$y = 0,0079x - 0,1041$	0,926	?
β-carotene	$y = 0,0012x + 0,0814$	0,9245	?
Diadinoxanthin	$y = 0,0028x - 0,0437$	0,6817	?
Diatoxanthin	$y = 0,0064x - 0,3419$	0,9031	?
DES	$y = 0,001x + 0,1998$	0,6878	?

Pigment	Equation	R ²	EC ₅₀ or IC ₅₀
Chlorophyll a	$y = 0,0034x - 0,1587$	0,7726	193,73529
Chlorophyll c	$y = 0,0028x - 0,1931$	0,7840	247,536
Pheophythin a	$y = 0,0054x + 0,6211$	0,8601	-20,556
Fucoxanthin	$y = 0,0079x - 0,1041$	0,926	76,468354
β-carotene	$y = 0,0012x + 0,0814$	0,9245	348,833
Diadinoxanthin	$y = 0,0028x - 0,0437$	0,6817	191,78571
Diatoxanthin	$y = 0,0064x - 0,3419$	0,9031	131,547
DES	$y = 0,001x + 0,1998$	0,6878	300,2

*Which one is the best parameter and the most reliable EC₅₀ or IC₅₀ concentration for *P. tricornutum* exposure to glyphosate? And why?*

Pigment	Equation	R ²	EC ₅₀ or IC ₅₀
Chlorophyll a	$y = 0,0034x - 0,1587$	0,7726	193,73529
Chlorophyll c	$y = 0,0028x - 0,1931$	0,7840	247,536
Pheophythin a	$y = 0,0054x + 0,6211$	0,8601	-20,556
Fucoxanthin	$y = 0,0079x - 0,1041$	0,926	76,468354
β-carotene	$y = 0,0012x + 0,0814$	0,9245	348,833
Diadinoxanthin	$y = 0,0028x - 0,0437$	0,6817	191,78571
Diatoxanthin	$y = 0,0064x - 0,3419$	0,9031	131,547
DES	$y = 0,001x + 0,1998$	0,6878	300,2

Why is the enhancement concentration EC₅₀ is much lower than the inhibition concentration IC₅₀?