

Article

Treatment of Wastewaters Containing Sulfonylurea Herbicides by Electroflotation: Chemical and Ecotoxicological Efficacy

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Supplementary material

Table S1. Results of pH, conductivity (COND; $\mu\text{S}/\text{cm}$) and dissolved oxygen (DO; % saturation) measured at the start (in the control and each prepared test solution; $n = 1$) and at the end (in two replicates; $n = 2$) of the 48 h lethal test with the cadoceran *Daphnia magna* conducted on the untreated (A0) and electroflotation-treated (A3) wastewater solutions (both diluted in a $\times 2$ factor from 80 to 5.0%).

Treatment	A0 solution test			A3 solution test		
START ($n = 1$)	pH	COND	DO	pH	COND	DO
control	7.65	561	> 60	7.53	560	> 60
5.0	7.70	492	> 60	7.65	560	> 60
10	7.73	560	> 60	7.67	559	> 60
20	7.80	459	> 60	7.66	558	> 60
40	7.78	353	> 60	7.66	554	> 60
80	7.44	138	> 60	7.36	545	> 60
END ($n = 2$)	pH	COND	DO	pH	COND	DO
control	8.04 / 7.83	568 / 565	> 60	7.92 / 8.04	568 / 570	> 60
5.0	8.04 / 8.02	540 / 541	> 60	8.06 / 8.06	567 / 567	> 60
10	8.01 / 7.99	514 / 503	> 60	8.01 / 8.04	565 / 567	> 60
20	7.94 / 7.92	466 / 464	> 60	8.04 / 8.01	568 / 566	> 60
40	7.81 / 7.81	366 / 362	> 60	7.88 / 7.89	565 / 561	> 60
80	7.33 / 7.41	142 / 138	> 60	7.60 / 7.42	556 / 551	> 60

Table S2. Results of the cell density (CD; $\times 10^4$ cells mL^{-1}) and specific growth rate per day (SGR; d^{-1}) of the microalgae *Raphidocelis subcapitata* used as test organism to conduct 72 h growth tests on the untreated (A0) and electroflotation-treated (A3) wastewater solutions (both diluted in a $\times 2$ factor from 100 to 3.13%). Both toxicity tests were conducted simultaneously using the same control treatment (MBL growth medium diluted 2.5 times) replicated six times ($n = 6$) and each test solution was replicated three times ($n = 3$).

Treatment	Measured response			
Control	CD		SGR	
($n = 6$)	139; 213; 145; 155; 130; 131		1.64; 1.79; 1.66; 1.68; 1.62; 1.63	
	A0 test solutions (%)		A3 test solutions (%)	
($n = 3$)	CD	SGR	CD	SGR
	5.47	0.57	7.81	0.69
3.13	4.38	0.49	2.66	0.33
	4.38	0.49	3.13	0.38
	2.97	0.36	6.88	0.64
6.25	3.13	0.38	1.72	0.18
	3.44	0.41	2.66	0.33
	3.59	0.43	3.75	0.44
12.5	2.66	0.33	3.59	0.43
	2.66	0.33	1.72	0.18

25.0	2.50	0.31	1.83	0.20
	2.03	0.24	1.83	0.20
	2.03	0.24	2.03	0.24
50.0	2.66	0.33	3.75	0.44
	2.34	0.28	3.59	0.43
	1.56	0.15	2.34	0.28
100	1.09	0.030	2.50	0.31
	1.09	0.030	1.88	0.21
	1.25	0.074	1.88	0.21

Table S3. Results of the cumulative number of dead organisms of the cladoceran *Daphnia magna* used as test organism to conduct 48 h lethal tests on the untreated (A0) and electroflotation-treated (A3) wastewater solutions (both diluted in a $\times 2$ factor from 80 to 5.0%). Both toxicity tests were conducted with the control and each test solution replicated four times ($n = 4$).

Treatment ($n = 4$)	A0 solution test				A3 solution test			
	rep 1	rep 2	rep 3	rep 4	rep 1	rep 2	rep 3	rep 4
control	0	0	0	0	0	0	0	0
5.0	0	0	0	0	0	0	0	0
10	0	1	0	0	0	0	0	0
20	4	4	1	3	4	4	3	4
40	4	5	4	4	5	4	5	5
80	5	5	4	5	5	5	5	5

Table S4. Results of the statistical analysis, by one-way analysis of variance (ANOVA), conducted to evaluate the effects of the of untreated (A0) and electroflotation-treated (A3) solutions (both diluted in a $\times 2$ factor from 100 to 3.13%) on the growth rate responses of the microalgae *Raphidocelis subcapitata*. All tests were carried out with the software STATISTICA Version 7.0 (StatSoft, Inc., Tulsa, USA) with the level of significance set at 0.05.

Assumptions for one-way ANOVA		
	Normality	Homoscedasticity
	Shapiro-Wilk's test ^a	Bartlett's test
A0 solutions test	W = 0.73, P < 0.05	$\chi^2 = 4.63$, P = 0.605, df = 6
A3 solutions test	W = 0.72, P < 0.05	$\chi^2 = 12.3$, P = 0.055, df = 6
	One-way ANOVA	Dunnett's test
A0 solutions test	$F_{6,17} = 478$, P < 0.0001	all dilutions significantly lower than control: P < 0.0001
A3 solutions test	$F_{6,17} = 85$, P < 0.0001	all dilutions significantly lower than control: P < 0.0001
One-way ANOVA		
A0 versus A3 – 3.13%	$F_{1,4} = 0.215$, P = 0.66	
A0 versus A3 – 6.25%	$F_{1,4} = 0.00166$, P = 0.99	
A0 versus A3 – 12.5%	$F_{1,4} = 0.0122$, P = 0.92	
A0 versus A3 – 25%	$F_{1,4} = 3.23$, P = 0.15	
A0 versus A3 – 50%	$F_{1,4} = 3.20$, P = 0.15	
A0 versus A3 – 100%	$F_{1,4} = 31.2$, P < 0.01	

^a the null hypothesis was rejected but one-way ANOVA was conducted on the original data because: (1) it is a fairly robust analysis against violations of normality assumption and (2) the null hypothesis to test homoscedasticity was accepted.