Development of a microplate-based novel toxicity bioassay using Chlorophyta and Phaeophyceae macroalgae

Supplementary Information

Toxicity testing of typical toxicants using microplate-based growth and reproduction in Chlorophyta and Phaeophyceae macroalgae

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Table S1 Nominal and actual concentrations of the growth inhibition tests using macroalgae

Species	$K_2Cr_2O_7$					3,5-DCP					Diuron					Simazine				
	Conc. (μg Cr/L)[a]					Conc. (μg/L)					Conc. (μg/L)					Conc. (μg/L)				
	Nominal	Actual			R (%)	Nominal	Actual			R (%)	Nominal	Actual			R (%)	Nominal	Actual			R (%)
		0 d	3 d	Geometric mean			0 d	3 d	Geometric mean			0 d	3 d	Geometric mean			0 d	3 d	Geometric mean	
Ulva aragoënsis	control	<0.3	<0.3	<0.3		control	<3	<3	<3		control	<0.4	<0.4	<0.4		control	<2	<2	<2	
											SC	<0.4	<0.4	<0.4		SC	<2	<2	<2	
	250	267.1	250.7	258.8	104	500	565	354	447	89	1	1.06	1.08	1.07	107	10	9	10	9	91
	500	536.3	511.9	524.0	105	1,000	1,059	1,088	1,074	107	2	2.40	1.97	2.17	109	20	16	16	16	80
	1,000	1,130.7	1,065.9	1,097.8	110	2,000	2,456	2,381	2,418	121	4	3.84	3.82	3.83	96	40	31	35	33	82
	2,000	2,207.3	2,047.5	2,125.9	106	4,000	3,941	5,226	4,538	113	8	8.80	7.76	8.26	103	80	66	61	63	79
	4,000	4,445.7	4,134.9	4,287.5	107	8,000	7,761	9,516	8,594	107	16	15.73	14.33	15.01	94	160	109	107	108	67
		0 d	7 d				0 d	7 d												
Undaria pinnatifida	control	<0.3	<0.3	<0.3		control	<3	<3	<3											
	2,500	1,719.3	2,269.1	1,975.1	79	250	249	25	79	32										
	5,000	4,454.7	4,615.3	4,534.3	91	500	444	74	181	36										
	10,000	10,417.7	9,599.3	10,000.1	100	1,000	933	318	545	54										
	20,000	20,575.2	18,386.4	19,450.1	97	2,000	1,883	1,139	1,464	73										
	40,000	40,944.1	37,967.2	39,427.6	99	4,000	3,525	2,809	3,147	79										
		0 d	7 d				0 d	7 d				0 d	7 d				0 d	7 d		
Ectocarpus siliculosus	control	<0.3	<0.3	<0.3		control	<3	32	7		control	<0.4	<0.4	<0.4		control	<2	<2	<2	
											SC	<0.4	<0.4	<0.4		SC	<2	<2	<2	
	250	225.7	202.7	213.9	86	250	281	61	131	52	0.5	0.48	0.53	0.50	100	50	26	47	35	70
	500	471.7	415.2	442.6	89	500	560	106	243	49	1	0.99	1.08	1.04	104	100	75	91	83	83
	1,000	959.1	846.1	900.8	90	1,000	1,000	454	674	67	2	2.14	2.20	2.17	108	200	161	160	160	80

2,000	1,915.2	1,684.7	1,796.3	90	2,000	2,183	1,784	1,973	99	4	3.98	3.62	3.80	95	400	252	296	273	68
4,000	3,748.5	3,689.1	3,718.7	93	4,000	4,356	3,668	3,997	100	8	7.51	8.91	8.18	102	800	512	581	545	68
	0 d	10 d				0 d	10 d												
control	<0.3	<0.3	<0.3		control	<3	<3	<3											
250	225.7	211.9	218.7	87	250	281	7	46	18										
500	471.7	429.9	450.4	90	500	560	33	136	27										
1,000	959.1	857.0	906.6	91	1,000	1,000	306	554	55										
2,000	1,915.2	1,816.3	1,865.1	93	2,000	2,183	1,656	1,901	95										
4,000	3,748.5	3,914.3	3,830.5	96	4,000	4,356	3,388	3,842	96										

$K_2Cr_2O_7$, potassium dichromate; R, recovery; 3,5-DCP, 3,5-dichlorophenol; a, the concentration is shown as chromium concentration.

Table S2 Water quality parameters for the inhibition tests on growth and sporangia formation of macroalgae using potassium dichromate, 3,5-dichlorophenol, diuron, and simazine

Tests	Temperature (°C)	pH	Salinity (PSU)	Light intensity (μmol/m^2/s)
Growth inhibition tests				
Ulva aragoënsis	19.4 ± 1.9	7.8 ± 0.1	31 ± 0 [a]	31 ± 1
Undaria pinnatifida	14.2 ± 0.0	7.9 ± 0.0	33 ± 0	54 ± 2
Ectocarpus siliculosus	12.7 ± 0.1	7.8 ± 0.0	32 ± 0 [a]	63 ± 1
Sporangia formation inhibition tests				
Ectocarpus siliculosus	12.7 ± 0.2	7.9 ± 0.0	33 ± 0	58 ± 1

Data are expressed as means ± standard error; a, Data are without freshwater tolerance values.

Table S3 Nominal and actual concentrations of the sporangia formation inhibition tests using *Ectocarpus siliculosus*

Species	$K_2Cr_2O_7$					3,5-DCP					Diuron					Simazine				
	Conc. (Cr μg/L)[a]				R (%)	Conc. (μg/L)				R (%)	Conc. (μg/L)				R (%)	Conc. (μg/L)				R (%)
	Nominal	Actual				Nominal	Actual				Nominal	Actual				Nominal	Actual			
		0 d	3 d	Geometric mean			0 d	3 d	Geometric mean			0 d	3 d	Geometric mean			0 d	3 d	Geometric mean	
	control	<0.3	<0.3	<0.3		control	<4	<4	<4		control	<0.4	<0.4	<0.4		control	<2	<2	<2	
											SC	<0.4	<0.4	<0.4		SC	<2	<2	<2	
Ectocarpus siliculosus	250	210.1	206.6	208.3	83	250	286	220	250	100	0.5	0.6	0.4	0.5	95	50	54	55	55	109
	500	445.2	418.2	431.5	86	500	477	419	447	89	1	1.1	0.9	1.0	103	100	113	113	113	113
	1,000	986.1	904.3	944.3	94	1,000	930	799	862	86	2	2.0	1.7	1.8	91	200	207	227	217	108
	2,000	1,866.0	1,606.5	1,731.4	87	2,000	2,330	1,928	2,120	106	4	5.0	3.7	4.3	108	400	385	417	401	100
	4,000	3,686.9	3,406.4	3,543.9	89	4,000	4,126	3,454	3,775	94	8	8.9	8.1	8.5	106	800	639	849	736	92

$K_2Cr_2O_7$, potassium dichromate; R, recovery; 3,5-DCP, 3,5-dichlorophenol; a, the concentration is shown as chromium concentration.

Table S4 Parameters for mass spectrometric detection of analytes

Compounds	RT (min)	ESI mode	Quantification MRM1	Confirmation MRM2	Confirmation MRM3
3,5-DCP	5.3	-	161.05 > 125.00	161.05 > 35.00	161.05 > 89.00
Diuron	4.4	+	233.05 > 72.10	233.05 > 46.15	233.05 > 18.20
Simazine	3.2	+	202.10 > 71.15	202.10 > 68.10	202.10 > 43.15
Atrazine-$^{13}C_3$	4.3	+	219.05 > 177.05	219.05 > 98.05	219.05 > 70.10

3,5-DCP, 3,5-dichlorophenol; RT, retention time; ESI, electrospray ionization; MRM, multiple reaction monitoring.

Table S5 Species included in the acute and chronic toxicity concentration levels, collected from the United States Environmental Protection Agency Ecotox database (https://cfpub.epa.gov/ecotox/)

Chemical	Species	Species Group	Media Type	Duration Days	Endpoint	Effect	Conc. (mg/L)	Source	Publication Year
3,5-DCP	Cyanobium sp.	Algae	Salt water	3	EC50	Population	1.71	Ecotoxicology25(10): 1751-1758	2016
3,5-DCP	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.94	Arch. Environ. Contam. Toxicol.19(4): 518-522	1990
3,5-DCP	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	5.32	Environ. Sci. Technol.18(9): 713-718	1984
3,5-DCP	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	6.1	Environ. Sci. Technol.18(9): 713-718	1984
3,5-DCP	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	6.67	Ecotoxicol. Environ. Saf.54(3): 346-354	2003
3,5-DCP	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	4	EC50	Population	1.5	Ambio28(2): 152-155	1999
3,5-DCP	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Population	4.89824616	Environ. Toxicol. Chem.23(4): 1074-1079	2004
3,5-DCP	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Growth	1.808	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	5	EC50	Development	12.11113776	Bull. Environ. Contam. Toxicol.79(5): 499-503	2007
3,5-DCP	Myriophyllum aquaticum	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Population	0.695	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Myriophyllum spicatum	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Growth	3.4	Ecotoxicol. Environ. Saf.97:32-39	2013
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.89	Bull. Environ. Contam. Toxicol.55(6): 922-928	1995
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	1.79	Ecotoxicology17(3): 165-171	2008
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	2.13	Environ. Toxicol. Chem.17(6): 1091-1098	1998
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Growth	2.3	Jpn. J. Toxicol. Environ. Health34(4): 343-349	1988
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Growth	2.3	Environ. Toxicol. Chem.7(10): 847-854	1988
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	3.1	Environ. Toxicol. Chem.25(8): 2208-2215	2006
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	3.2	Chemosphere30(11): 2103-2115	1995
3,5-DCP	Cyanobium sp.	Algae	Salt water	3	NOEC	Population	0.625	Ecotoxicology25(10): 1751-1758	2016
3,5-DCP	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Growth	0.625	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	5	NOEC	Development	0.9780192	Bull. Environ. Contam. Toxicol.79(5): 499-503	2007
3,5-DCP	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Population	1.25	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Myriophyllum aquaticum	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Growth	1.8	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Myriophyllum aquaticum	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Population	3.2	Environ. Toxicol. Chem.34:2104-2115	2015
3,5-DCP	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.38	Bull. Environ. Contam. Toxicol.55(6): 922-928	1995
$K_2Cr_2O_7$	Anacystis aeruginosa	Algae	Fresh water	4	EC50	Growth	0.389	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Anacystis aeruginosa	Algae	Fresh water	4	EC50	Growth	0.389	Rep.No.R85/083, Natl.Inst.Public Health Environ.Hyg.:26 p.	1985
$K_2Cr_2O_7$	Chlamydomonas reinhardtii	Algae	Fresh water	3	EC50	Population	0.8128	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Chlorella pyrenoidosa	Algae	Fresh water	4	EC50	Growth	0.354	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Chlorella sp.	Algae	Fresh water	1.8333	EC50	Population	0.00000232	Chemosphere37(13): 2665-2676	1998
$K_2Cr_2O_7$	Chlorella vulgaris	Algae	Fresh water	12	EC50	Population	0.88	J. Appl. Phycol.19:701-710	2007

$K_2Cr_2O_7$	Cyanobium sp.	Algae	Salt water	3	EC50	Population	4.61	Ecotoxicology25(10): 1751-1758	2016
$K_2Cr_2O_7$	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.27	Ecotoxicol. Environ. Saf.54(3): 346-354	2003
$K_2Cr_2O_7$	Desmodesmus subspicatus	Algae	Fresh water	4	EC50	Population	0.35	Water Res.24(1): 31-38	1990
$K_2Cr_2O_7$	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.4	Ecotoxicol. Environ. Saf.42(3): 274-281	1999
$K_2Cr_2O_7$	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.52	Arch. Environ. Contam. Toxicol.19(4): 518-522	1990
$K_2Cr_2O_7$	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.7499	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Euglena gracilis	Algae	Fresh water	4	EC50	Growth	0.117	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Gomphonema parvulum	Algae	Fresh water	4	EC50	Growth	0.15	Rep.No.R85/083, Natl.Inst.Public Health Environ.Hyg.:26 p.	1985
$K_2Cr_2O_7$	Gracilaria tenuistipitata	Algae	Salt water	4	EC50	Population	0.6	Hydrobiologia326/327:317-325	1996
$K_2Cr_2O_7$	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	2	EC50	Growth	0.2379	Aquat. Toxicol.140/141:415-424	2013
$K_2Cr_2O_7$	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	2	EC50	Growth	1.1483	Aquat. Toxicol.140/141:415-424	2013
$K_2Cr_2O_7$	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	2	EC50	Growth	0.3418	Aquat. Toxicol.140/141:415-424	2013
$K_2Cr_2O_7$	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	10	EC50	Population	26.98	Sci. Total Environ.Suppl.:761-772	1993
$K_2Cr_2O_7$	Microcystis aeruginosa	Algae	Fresh water	7	EC50	Population	0.211	Arch. Environ. Contam. Toxicol.36(1): 1-6	1999
$K_2Cr_2O_7$	Microcystis aeruginosa	Algae	Fresh water	7	EC50	Population	0.211	Chemosphere40(7): 731-739	2000
$K_2Cr_2O_7$	Navicula seminulum	Algae	Fresh water	4	EC50	Population	0.187	Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA:89 p.	1960
$K_2Cr_2O_7$	Oscillatoria agardhii	Algae	Fresh water	4	EC50	Growth	0.901	Rep.No.R85/083, Natl.Inst.Public Health Environ.Hyg.:26 p.	1985
$K_2Cr_2O_7$	Parachlorella kessleri	Algae	Fresh water	3	EC50	Population	0.5754	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.0657	Environ. Toxicol. Chem.14(2): 299-302	1995
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.0843	Environ. Toxicol. Water Qual.7(1): 35-48	1992
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.17	Environ. Toxicol. Water Qual.6(4): 383-403	1991
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.183	Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI:74 p.	1981
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.37	Chemosphere37(14-15): 2949-2955	1998
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.3961	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Culture	4	EC50	Population	0.4	Environ. Toxicol. Chem.37(1): 201-212	2018
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	0.51	Environ. Toxicol. Chem.26(1): 85-91	2007
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.59	Chemosphere40(7): 731-739	2000
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.65	Arch. Environ. Contam. Toxicol.19(4): 518-522	1990
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.66	Environ. Sci. Technol.18(9): 713-718	1984
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	0.67	Chemosphere204:405-412	2018
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Growth	0.901	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.96	Ecotoxicology17(3): 165-171	2008

$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	1.38	Environ. Toxicol. Chem.17(6): 1091-1098	1998
$K_2Cr_2O_7$	Scenedesmus pannonicus	Algae	Fresh water	4	EC50	Growth	0.318	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Scenedesmus quadricauda	Algae	Fresh water	3	EC50	Population	2.5268	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Selenastrum capricornutum	Algae	Fresh water	3	EC50	Population	0.76	EPA/OTS Doc.#86950000254:31 p.	1995
$K_2Cr_2O_7$	Selenastrum capricornutum	Algae	Fresh water	4	EC50	Population	1	EPA/OTS 86-930000335:37 p.	1993
$K_2Cr_2O_7$	Skeletonema costatum	Algae	Salt water	5	EC50	Population	14.7	Environ. Toxicol. Chem.8(5): 451-455	1989
$K_2Cr_2O_7$	Spirodela polyrrhiza	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Population	3.5	Environ. Toxicol.19:351-358	2004
$K_2Cr_2O_7$	Stephanodiscus hantzschii	Algae	Fresh water	4	EC50	Growth	0.00051	Report No.CL81/100, National Institute of Public Health and Environmental Hygiene:107 p.	1981
$K_2Cr_2O_7$	Stephanodiscus hantzschii	Algae	Fresh water	4	EC50	Growth	0.00051	Rep.No.R85/083, Natl.Inst.Public Health Environ.Hyg.:26 p.	1985
$K_2Cr_2O_7$	Stichococcus bacillaris	Algae	Fresh water	3	EC50	Population	1.6419	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Synechococcus leopoliensis	Algae	Fresh water	4	EC50	Population	3.3075	Chemosphere38(14): 3329-3338	1999
$K_2Cr_2O_7$	Synechocystis sp.	Algae	Fresh water	6	EC50	Population	2	Bioresour. Technol.100(23): 5588-5593	2009
$K_2Cr_2O_7$	Galdieria sulphuraria	Algae	Fresh water	42	LC50	Mortality	38.8323408	Boll. Soc. Nat. Napoli95:303-316	1986
$K_2Cr_2O_7$	Nitzschia linearis	Algae	Fresh water	5	LC50	Mortality	0.208	Prog. Fish-Cult.30(3): 137-140	1968
$K_2Cr_2O_7$	Chlorella sp.	Algae	Fresh water	1.8333	NOEC	Population	1.04E-07	Chemosphere37(13): 2665-2676	1998
$K_2Cr_2O_7$	Cyanobium sp.	Algae	Salt water	3	NOEC	Population	1.76	Ecotoxicology25(10): 1751-1758	2016
$K_2Cr_2O_7$	Gracilaria sp.	Algae	Salt water	4	NOEC	Population	2.2	Hydrobiologia326/327:317-325	1996
$K_2Cr_2O_7$	Gracilaria tenuistipitata	Algae	Salt water	4	NOEC	Population	0.04	Hydrobiologia326/327:317-325	1996
$K_2Cr_2O_7$	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	2	NOEC	Population	5.883688	Environ. Toxicol.19(2): 95-102	2004
$K_2Cr_2O_7$	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	14	NOEC	Growth	0.1	Bull. Environ. Contam. Toxicol.73(2): 416-423	2004
$K_2Cr_2O_7$	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	14	NOEC	Population	0.05	Bull. Environ. Contam. Toxicol.73(2): 416-423	2004
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	1	NOEC	Population	0.017	Water Air Soil Pollut.213(1-4): 57-70	2010
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.07	Chemosphere76(10): 1372-1379	2009
$K_2Cr_2O_7$	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.1	Bull. Environ. Contam. Toxicol.55(6): 922-928	1995
$K_2Cr_2O_7$	Skeletonema costatum	Algae	Salt water	5	NOEC	Population	1	Environ. Toxicol. Chem.8(5): 451-455	1989
Diuron	Achnanthidium minutissimum	Algae	Fresh water	4	EC50	Population	0.056	Sci. Total Environ.463/464:469-477	2013
Diuron	Achnanthidium minutissimum	Algae	Fresh water	4	EC50	Population	0.108	PLoS One7(8): 1-9	2012
Diuron	Apium nodiflorum	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Growth	0.00000026	Chemosphere63(5): 734-743	2006
Diuron	Ceramium tenuicorne	Algae	Salt water	7	EC50	Population	0.0034	Mar. Pollut. Bull.52(12): 1661-1667	2006
Diuron	Chara vulgaris	Algae	Fresh water	14	EC50	Growth	0.00035	Chemosphere63(5): 734-743	2006
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	1	EC50	Population	0.025640692	Aquat. Toxicol.110/111:214-224	2012
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	2	EC50	Reproduction	0.041957496	Aquat. Toxicol.162:18-28	2015
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	2	EC50	Population	0.081817117	Environ. Toxicol. Chem.31(12): 2832-2840	2012
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	1	EC50	Population	0.111886656	Aquat. Toxicol.167:209-219	2015
Diuron	Chlorella fusca	Algae	Fresh water	1	EC50	Population	0.006992916	Aquat. Toxicol.101(1): 266-275	2011

Diuron	Chlorella fusca	Algae	Fresh water	2	EC50	Population	0.0143	Chemosphere137:70-77	2015
Diuron	Chlorella pyrenoidosa	Algae	Fresh water	4	EC50	Population	0.0013	Bull. Environ. Contam. Toxicol.66(4): 536-541	2001
Diuron	Chlorella pyrenoidosa	Algae	Fresh water	4	EC50	Population	0.0023	Weed Sci.50(5): 555-559	2002
Diuron	Chlorella vulgaris	Algae	Fresh water	4	EC50	Population	0.0043	Ecotoxicol. Environ. Saf.51(2): 128-132	2002
Diuron	Chlorella vulgaris	Algae	Fresh water	4	EC50	Population	0.004661944	Anal. Chim. Acta530(2): 191-197	2005
Diuron	Chlorella vulgaris	Algae	Fresh water	3	EC50	Population	0.045	Ecotoxicol. Environ. Saf.106:213-219	2014
Diuron	Chlorococcum hypnosporum	Algae	Fresh water	4	EC50	Population	0.025	J. Appl. Bacteriol.57(2): 369-379	1984
Diuron	Chlorococcum sp.	Algae	Salt water	10	EC50	Population	0.01	Hyacinth Control J.10:45-48	1972
Diuron	Chroococcus minor	Algae	Salt water	7	EC50	Population	0.0047	Mar. Pollut. Bull.62(5): 1147-1151	2011
Diuron	Coccolithus huxleyi	Algae	Salt water	3	EC50	Population	0.00226	Mar. Ecol. Prog. Ser.286:1-12	2005
Diuron	Craticula accomoda	Algae	Fresh water	4	EC50	Population	1.426	Sci. Total Environ.463/464:469-477	2013
Diuron	Craticula accomoda	Algae	Fresh water	4	EC50	Population	1.734	PLoS One7(8): 1-9	2012
Diuron	Cyclotella meneghiniana	Algae	Fresh water	4	EC50	Population	0.023	PLoS One7(8): 1-9	2012
Diuron	Cyclotella meneghiniana	Algae	Fresh water	4	EC50	Population	0.049	Sci. Total Environ.463/464:469-477	2013
Diuron	Cymbella sp.	Algae	Fresh water	2	EC50	Population	0.438	Sci. Total Environ.557-558:636-643	2016
Diuron	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.036	Ecotoxicol. Environ. Saf.27(1): 64-81	1994
Diuron	Desmodesmus subspicatus	Algae	Fresh water	3	EC50	Population	0.0463	Ecotoxicol. Environ. Saf.74(1): 117-122	2011
Diuron	Dunaliella tertiolecta	Algae	Fresh water	4	EC50	Population	0.0049	Aquat. Toxicol.85(3): 184-191	2007
Diuron	Dunaliella tertiolecta	Algae	Salt water	4	EC50	Population	0.0092	Environ. Toxicol.28(7): 359-371	2013
Diuron	Dunaliella tertiolecta	Algae	Salt water	10	EC50	Population	0.02	Hyacinth Control J.10:45-48	1972
Diuron	Encyonema gracile	Algae	Fresh water	2	EC50	Population	0.047	Sci. Total Environ.557-558:636-643	2016
Diuron	Encyonema silesiacum	Algae	Fresh water	4	EC50	Population	0.00879	PLoS One7(8): 1-9	2012
Diuron	Encyonema silesiacum	Algae	Fresh water	4	EC50	Population	0.286	Sci. Total Environ.463/464:469-477	2013
Diuron	Eolimna minima	Algae	Fresh water	4	EC50	Population	4.236	PLoS One7(8): 1-9	2012
Diuron	Fistulifera saprophila	Algae	Fresh water	4	EC50	Population	0.091	Environ. Sci. Technol.48(3): 1921-1930	2014
Diuron	Fragilaria capucina	Algae	Fresh water	4	EC50	Population	0.00403	PLoS One7(8): 1-9	2012
Diuron	Fragilaria capucina	Algae	Fresh water	4	EC50	Population	0.00889	Sci. Total Environ.463/464:469-477	2013
Diuron	Fragilaria capucina	Algae	Fresh water	4	EC50	Population	0.044	Sci. Total Environ.463/464:469-477	2013
Diuron	Fragilaria crotonensis	Algae	Fresh water	4	EC50	Population	0.21	Environ. Sci. Technol.48(3): 1921-1930	2014
Diuron	Gomphonema clavatum	Algae	Fresh water	4	EC50	Population	0.048	Environ. Sci. Technol.48(3): 1921-1930	2014
Diuron	Gomphonema gracile	Algae	Fresh water	2	EC50	Population	0.395	Sci. Total Environ.557-558:636-643	2016
Diuron	Gomphonema parvulum	Algae	Fresh water	4	EC50	Population	1.423	Sci. Total Environ.463/464:469-477	2013
Diuron	Gomphonema parvulum	Algae	Fresh water	4	EC50	Population	2.255	PLoS One7(8): 1-9	2012
Diuron	Gomphonema sp.	Algae	Fresh water	2	EC50	Population	0.003	Sci. Total Environ.557-558:636-643	2016
Diuron	Gracilaria tenuistipitata	Algae	Salt water	4	EC50	Population	0.015	Hydrobiologia326/327:317-325	1996
Diuron	Hormosira banksii	Algae	Salt water	2	EC50	Reproduction	4.65	Environ. Pollut.140(1): 43-51	2006
Diuron	Hormosira banksii	Algae	Salt water	2	EC50	Reproduction	6.29	Mar. Pollut. Bull.52(9): 1048-1055	2006
Diuron	Isochrysis galbana	Algae	Salt water	10	EC50	Population	0.01	Hyacinth Control J.10:45-48	1972
Diuron	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0078	Environ. Pollut.220:818-827	2017

Diuron	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0094	Environ. Pollut.220:818-827	2017
Diuron	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0099	Environ. Pollut.220:818-827	2017
Diuron	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Growth	0.0283	Chemosphere119:S69-S74	2015
Diuron	Lemna perpusilla	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Population	0.014918221	J. Agric. Univ. P. R.63(4): 483-488	1974
Diuron	Lemna sp.	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Growth	0.011	Toxicol. Environ. Health Sci.2(1): 39-49	2010
Diuron	Mayamaea fossalis	Algae	Fresh water	4	EC50	Population	0.139	Sci. Total Environ.463/464:469-477	2013
Diuron	Mayamaea fossalis	Algae	Fresh water	4	EC50	Population	0.463	PLoS One7(8): 1-9	2012
Diuron	Myriophyllum spicatum	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Growth	0.005	Chemosphere63(5): 734-743	2006
Diuron	Navicula forcipata	Algae	Fresh water	4	EC50	Population	0.025	Aquat. Toxicol.85(3): 184-191	2007
Diuron	Navicula sp.	Algae	Salt water	3	EC50	Population	0.003729555	Mar. Pollut. Bull.56(9): 1545-1552	2008
Diuron	Nephroselmis pyriformis	Algae	Salt water	3	EC50	Population	0.00582743	Mar. Pollut. Bull.56(9): 1545-1552	2008
Diuron	Nitzschia palea	Algae	Fresh water	4	EC50	Population	1.539	PLoS One7(8): 1-9	2012
Diuron	Nitzschia palea	Algae	Fresh water	4	EC50	Population	1.667	Sci. Total Environ.463/464:469-477	2013
Diuron	Nitzschia pungens	Algae	Salt water	4	EC50	Population	0.00664	Mar. Pollut. Bull.124(2): 811-818	2016
Diuron	Phaeodactylum tricornutum	Algae	Salt water	10	EC50	Population	0.01	Hyacinth Control J.10:45-48	1972
Diuron	Porphyridium aerugineum	Algae	Fresh water	4	EC50	Population	0.03496458	Phycologia36(6): 479-487	1997
Diuron	Pyrocystis lunula	Algae	Salt water	1	EC50	Population	19	Environ. Toxicol.23(5): 617-625	2008
Diuron	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.0007	Ecotoxicol. Environ. Saf.63(3): 456-462	2006
Diuron	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.0024	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Diuron	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.0223	Environ. Toxicol. Chem.31(2): 377-386	2012
Diuron	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.024	Bull. Environ. Contam. Toxicol.83(4): 484-487	2009
Diuron	Raphidocelis subcapitata	Algae	Salt water	3	EC50	Population	0.045	Chromatographia (Wiesb.)56(3/4): 199-206	2002
Diuron	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.045	Sci. World J.2:1115-1120	2002
Diuron	Scenedesmus acutus	Algae	Fresh water	4	EC50	Population	0.00409	Bull. Environ. Contam. Toxicol.68(2): 275-281	2002
Diuron	Scenedesmus acutus	Algae	Fresh water	3	EC50	Population	0.023	Chemosphere75(3): 405-409	2009
Diuron	Scenedesmus quadricauda	Algae	Fresh water	4	EC50	Population	0.0027	Bull. Environ. Contam. Toxicol.71(3): 594-601	2003
Diuron	Selenastrum capricornutum	Algae	Fresh water	3	EC50	Population	0.045	Talanta65(2): 358-366	2005
Diuron	Sellaphora minima	Algae	Fresh water	4	EC50	Population	2.606	Sci. Total Environ.463/464:469-477	2013
Diuron	Skeletonema costatum	Algae	Salt water	4	EC50	Population	0.0059	Mar. Pollut. Bull.62(5): 1147-1151	2011
Diuron	Spirodela polyrrhiza	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Population	0.04079201	J. Agric. Univ. P. R.63(4): 483-488	1974
Diuron	Synechococcus sp.	Algae	Salt water	3	EC50	Population	0.00055	Mar. Ecol. Prog. Ser.286:1-12	2005
Diuron	Synechococcus sp.	Algae	Salt water	4	EC50	Population	0.11	Mar. Pollut. Bull.62(5): 1147-1151	2011
Diuron	Thalassiosira pseudonana	Algae	Salt water	4	EC50	Population	0.0043	Mar. Pollut. Bull.62(5): 1147-1151	2011
Diuron	Ulnaria ulna	Algae	Fresh water	4	EC50	Population	0.042	Sci. Total Environ.463/464:469-477	2013
Diuron	Ulnaria ulna	Algae	Fresh water	4	EC50	Population	0.051	PLoS One7(8): 1-9	2012
Diuron	Ulothrix fimbriata	Algae	Fresh water	4	EC50	Population	0.54	J. Appl. Bacteriol.57(2): 369-379	1984
Diuron	Anabaena doliolum	Algae	Fresh water	12	IC50	Population	0.4	Curr. Microbiol.45(3): 165-170	2002
Diuron	Anabaena variabilis	Algae	Fresh water	10	IC50	Population	0.03	Indian J. Exp. Biol.49(4): 298-303	2011
Diuron	Chaetoceros gracilis	Algae	Salt water	3	IC50	Population	0.036	Environ. Toxicol.21(4): 432-439	2006

Diuron	Chlamydomonas moewusii	Algae	Fresh water	7	IC50	Population	0.55943328	J. Phycol.19:301-305	1983
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	2.5	IC50	Population	0.004661944	Z. Naturforsch. Sect. C J. Biosci.52(9/10): 654-664	1997
Diuron	Entomoneis punctulata	Algae	Salt water	3	IC50	Population	0.024	Environ. Toxicol.23(5): 617-625	2008
Diuron	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	8	IC50	Population	0.010955568	Pestic. Sci.35(3): 283-289	1992
Diuron	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	7	IC50	Population	0.025	Environ. Pollut.106(1): 39-45	1999
Diuron	Nitzschia closterium	Algae	Salt water	3	IC50	Population	0.017	Environ. Toxicol.23(5): 617-625	2008
Diuron	Oscillatoria chalybea	Algae	Fresh water	4	IC50	Population	0.028	Aquaculture163(1-2): 85-99	1998
Diuron	Phaeodactylum tricornutum	Algae	Salt water	3	IC50	Population	0.020978748	Water Res.32(4): 1162-1168	1998
Diuron	Raphidocelis subcapitata	Algae	Fresh water	3	IC50	Population	0.0105	Environ. Toxicol. Chem.26(7): 1520-1531	2007
Diuron	Raphidocelis subcapitata	Algae	Fresh water	4	IC50	Population	0.016316804	Arch. Hydrobiol.140(2): 273-286	1997
Diuron	Scenedesmus acutus	Algae	Fresh water	1	IC50	Population	0.01	Meded. Fac. Landbouwwet. Rijksuniv. Gent65(2B): 843-852	2000
Diuron	Scenedesmus acutus	Algae	Fresh water	1	IC50	Population	0.01	Pestic. Biochem. Physiol.72(3): 178-185	2002
Diuron	Scenedesmus acutus	Algae	Fresh water	1	IC50	Population	0.01328654	Pestic. Sci.35(3): 283-289	1992
Diuron	Selenastrum capricornutum	Algae	Fresh water	3	IC50	Population	0.006992916	Environ. Pollut.157(1): 135-140	2009
Diuron	Selenastrum capricornutum	Algae	Fresh water	4	IC50	Population	0.0364	Aquaculture163(1-2): 85-99	1998
Diuron	Anabaena variabilis	Algae	Fresh water	14	LC50	Population	0.0058	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Ankistrodesmus sp.	Algae	Fresh water	14	LC50	Population	0.006	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Chlorella pyrenoidosa	Algae	Fresh water	14	LC50	Population	0.03	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Chlorella sp.	Algae	Fresh water	14	LC50	Population	0.04	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Chlorococcum sp.	Algae	Fresh water	14	LC50	Population	0.005	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Dictyosphaerium pulchellum	Algae	Fresh water	14	LC50	Population	0.006	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Hormidium flaccidum	Algae	Fresh water	14	LC50	Population	0.5	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Oscillatoria laetevirens	Algae	Fresh water	5	LC50	Population	0.48950412	Asian J. Microbiol. Biotechnol. Environ. Sci.10(3): 563-567	2008
Diuron	Oscillatoria sp.	Algae	Fresh water	14	LC50	Population	0.04	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Scenedesmus acutus	Algae	Fresh water	14	LC50	Population	0.05	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Scenedesmus quadricauda	Algae	Fresh water	14	LC50	Population	0.05	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Spirulina platensis	Algae	Fresh water	14	LC50	Population	0.0085	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Stichococcus sp.	Algae	Fresh water	14	LC50	Population	1.5	Acta Hydrobiol.23(2): 155-172	1981
Diuron	Apium nodiflorum	Flowers, Trees, Shrubs, Ferns	Fresh water	14	NOEC	Growth	0.00005	Chemosphere63(5): 734-743	2006
Diuron	Chara vulgaris	Algae	Fresh water	14	NOEC	Growth	0.0000005	Chemosphere63(5): 734-743	2006
Diuron	Chlamydomonas moewusii	Algae	Fresh water	7	NOEC	Mortality	6.992916	J. Phycol.19:301-305	1983
Diuron	Chlamydomonas reinhardtii	Algae	Fresh water	1	NOEC	Population	0.000769221	Aquat. Toxicol.110/111:214-224	2012
Diuron	Chlorella pyrenoidosa	Algae	Fresh water	3	NOEC	Population	0.002330972	Weed Sci.24(6): 587-593	1976
Diuron	Chroomonas acuta	Algae	Fresh water	40	NOEC	Population	0.005	Ecotoxicol. Environ. Saf.78:178-183	2012
Diuron	Coccolithus huxleyi	Algae	Salt water	3	NOEC	Population	0.00054	Mar. Ecol. Prog. Ser.286:1-12	2005
Diuron	Cryptomonas sp.	Algae	Fresh water	40	NOEC	Population	0.005	Ecotoxicol. Environ. Saf.78:178-183	2012
Diuron	Desmodesmus subspicatus	Algae	Fresh water	1	NOEC	Population	0.007	Ecotoxicol. Environ. Saf.27(1): 64-81	1994
Diuron	Entomoneis punctulata	Algae	Salt water	3	NOEC	Population	0.002	Environ. Toxicol.23(5): 617-625	2008

Diuron	Gomphonema gracile	Algae	Fresh water	14	NOEC	Mortality	0.005	Sci. Total Environ.734:1-9	2020
Diuron	Gracilaria tenuistipitata	Algae	Salt water	4	NOEC	Population	0.0013	Hydrobiologia326/327:317-325	1996
Diuron	Myriophyllum spicatum	Flowers, Trees, Shrubs, Ferns	Fresh water	14	NOEC	Growth	0.0000005	Chemosphere63(5): 734-743	2006
Diuron	Nitzschia closterium	Algae	Salt water	3	NOEC	Population	0.002	Environ. Toxicol.23(5): 617-625	2008
Diuron	Nitzschia pungens	Algae	Salt water	4	NOEC	Population	0.000283	Mar. Pollut. Bull.124(2): 811-818	2016
Diuron	Oocystis naegelii	Algae	Fresh water	40	NOEC	Population	0.005	Ecotoxicol. Environ. Saf.78:178-183	2012
Diuron	Planothidium lanceolatum	Algae	Fresh water	20	NOEC	Mortality	0.005	Sci. Total Environ.734:1-9	2020
Diuron	Pyrocystis lunula	Algae	Salt water	1	NOEC	Population	10	Environ. Toxicol.23(5): 617-625	2008
Diuron	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.0094	Environ. Toxicol. Chem.31(2): 377-386	2012
Diuron	Synechococcus sp.	Algae	Salt water	3	NOEC	Population	0.00021	Mar. Ecol. Prog. Ser.286:1-12	2005
Simazine	Anabaena circinalis	Algae	Fresh water	1	EC50	Population	0.16	J. Phycol.28:19-26	1992
Simazine	Anabaena flosaquae	Algae	Fresh water	5	EC50	Population	0.036	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Simazine	Chlamydomonas geitleri	Algae	Fresh water	3	EC50	Population	0.74613756	Aquat. Toxicol.16(3): 205-228	1990
Simazine	Chlamydomonas noctigama	Algae	Fresh water	3	EC50	Population	0.45	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Chlorella fusca	Algae	Fresh water	1	EC50	Population	0.0569	Aquat. Toxicol.56(1): 13-32	2001
Simazine	Chlorella fusca	Algae	Fresh water	1	EC50	Population	0.073	Sci. Total Environ.134(Suppl. 2): 941-952	1993
Simazine	Chlorella pyrenoidosa	Algae	Fresh water	4	EC50	Population	0.082	Bull. Environ. Contam. Toxicol.66(4): 536-541	2001
Simazine	Chlorella pyrenoidosa	Algae	Fresh water	4	EC50	Population	0.082	Weed Sci.50(5): 555-559	2002
Simazine	Chlorella vulgaris	Algae	Fresh water	4	EC50	Population	2.1738	Ecotoxicol. Environ. Saf.51(2): 128-132	2002
Simazine	Chlorococcum sp.	Algae	Salt water	10	EC50	Population	2	Hyacinth Control J.10:45-48	1972
Simazine	Cryptomonas pyrenoidifera	Algae	Fresh water	6	EC50	Population	0.5	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Cyanobium sp.	Algae	Salt water	3	EC50	Population	0.105	Ecotoxicology25(10): 1751-1758	2016
Simazine	Cyclotella sp.	Algae	Fresh water	6	EC50	Population	0.8	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Dunaliella tertiolecta	Algae	Salt water	1	EC50	Population	1.115	Water Res.17(12): 1757-1762	1983
Simazine	Dunaliella tertiolecta	Algae	Salt water	10	EC50	Population	5	Hyacinth Control J.10:45-48	1972
Simazine	Encyonema gracile	Algae	Fresh water	2	EC50	Population	0.145	Sci. Total Environ.557-558:636-643	2016
Simazine	Eunotia sudetica	Algae	Fresh water	2	EC50	Population	0.33	Sci. Total Environ.557-558:636-643	2016
Simazine	Gomphonema gracile	Algae	Fresh water	2	EC50	Population	0.288	Sci. Total Environ.557-558:636-643	2016
Simazine	Gomphonema sp.	Algae	Fresh water	2	EC50	Population	0.034	Sci. Total Environ.557-558:636-643	2016
Simazine	Isochrysis galbana	Algae	Salt water	10	EC50	Population	0.5	Hyacinth Control J.10:45-48	1972
Simazine	Lemna aequinoctialis	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0556	Environ. Pollut.220:818-827	2017
Simazine	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0792	Environ. Pollut.220:818-827	2017
Simazine	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Population	0.14	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Simazine	Lemna gibba	Flowers, Trees, Shrubs, Ferns	Fresh water	14	EC50	Population	0.42	Ecotoxicology7(3): 151-160	1998
Simazine	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	3	EC50	Population	0.0593	Environ. Pollut.220:818-827	2017
Simazine	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	4	EC50	Population	0.166	Arch. Environ. Contam. Toxicol.32(4): 353-357	1997
Simazine	Lemna minor	Flowers, Trees, Shrubs, Ferns	Fresh water	10	EC50	Population	0.55	Sci. Total Environ.Suppl.:761-772	1993
Simazine	Lemna sp.	Flowers, Trees, Shrubs, Ferns	Fresh water	7	EC50	Growth	0.422	Toxicol. Environ. Health Sci.2(1): 39-49	2010

Simazine	Microcystis aeruginosa	Algae	Fresh water	6	EC50	Population	0.5	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Navicula pelliculosa	Algae	Fresh water	5	EC50	Population	0.09	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Simazine	Phaeodactylum tricornutum	Algae	Salt water	10	EC50	Population	0.5	Hyacinth Control J.10:45-48	1972
Simazine	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.1	Water Res.34(14): 3523-3530	2000
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.1	ASTM Spec. Tech. Publ.:40-48	1990
Simazine	Raphidocelis subcapitata	Algae	Fresh water	5	EC50	Population	0.1	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Simazine	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.2	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.2	Water Sci. Technol.33(6): 129-138	1996
Simazine	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	0.241	Ecotoxicology20(6): 1167-1175	2011
Simazine	Raphidocelis subcapitata	Algae	Fresh water	3	EC50	Population	0.297	Chemosphere58(5): 571-578	2005
Simazine	Raphidocelis subcapitata	Algae	Fresh water	2	EC50	Population	0.42	Chemosphere204:405-412	2018
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	0.7485	Ecotoxicol. Environ. Saf.63(3): 456-462	2006
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	EC50	Population	1.24	Arch. Environ. Contam. Toxicol.32(4): 353-357	1997
Simazine	Scenedesmus acutus	Algae	Fresh water	4	EC50	Population	0.257	Bull. Environ. Contam. Toxicol.68(2): 275-281	2002
Simazine	Scenedesmus quadricauda	Algae	Fresh water	4	EC50	Population	0.15	Bull. Environ. Contam. Toxicol.71(3): 594-601	2003
Simazine	Skeletonema costatum	Algae	Salt water	5	EC50	Population	0.6	Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.:	1992
Simazine	Synechococcus leopoliensis	Algae	Fresh water	5	EC50	Population	0.12	Norw. J. Agric. Sci. Suppl.13:117-131	1994
Simazine	Ulva pertusa	Algae	Salt water	4	EC50	Reproduction	0.378	Aquat. Toxicol.221:7p.	2020
Simazine	Vallisneria americana	Flowers, Trees, Shrubs, Ferns	Fresh water	13	EC50	Growth	0.067	Environ. Toxicol. Chem.29(1): 201-211	2010
Simazine	Chlorella sp.	Algae	Fresh water	6	IC50	Population	1.30069926	Ph.D.Thesis, The Chinese University of Hong Kong, China:153 p.	2005
Simazine	Phaeodactylum tricornutum	Algae	Salt water	3	IC50	Population	0.58	Aquat. Toxicol.138/139:12-25	2013
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	IC50	Population	0.078646932	Arch. Hydrobiol.140(2): 273-286	1997
Simazine	Scenedesmus sp.	Algae	Fresh water	6	IC50	Population	1.498324884	Ph.D.Thesis, The Chinese University of Hong Kong, China:153 p.	2005
Simazine	Selenastrum sp.	Algae	Fresh water	3	IC50	Population	0.0486	Bull. Environ. Contam. Toxicol.73(6): 995-1000	2004
Simazine	Anabaena variabilis	Algae	Fresh water	14	LC50	Population	7.4	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Ankistrodesmus sp.	Algae	Fresh water	14	LC50	Population	0.087	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Chlorella pyrenoidosa	Algae	Fresh water	14	LC50	Population	0.1	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Chlorella sp.	Algae	Fresh water	14	LC50	Population	3.3	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Chlorococcum sp.	Algae	Fresh water	14	LC50	Population	0.008	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Dictyosphaerium pulchellum	Algae	Fresh water	14	LC50	Population	28	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Hormidium flaccidum	Algae	Fresh water	14	LC50	Population	0.09	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Oscillatoria sp.	Algae	Fresh water	14	LC50	Population	0.0082	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Scenedesmus acutus	Algae	Fresh water	14	LC50	Population	0.4	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Scenedesmus quadricauda	Algae	Fresh water	14	LC50	Population	0.065	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Spirulina platensis	Algae	Fresh water	14	LC50	Population	0.006	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Stichococcus sp.	Algae	Fresh water	14	LC50	Population	0.2	Acta Hydrobiol.23(2): 155-172	1981
Simazine	Chlorella fusca	Algae	Fresh water	1	NOEC	Population	0.0037	Aquat. Toxicol.56(1): 13-32	2001

Simazine	Chlorella vulgaris	Algae	Fresh water	4	NOEC	Population	0.1	ASTM Spec. Tech. Publ.:69-84	1990
Simazine	Chlorella vulgaris	Algae	Fresh water	4	NOEC	Population	0.1	Interagency Agreement No.40-1067-80, Prepared for the U.S.EPA, Washington, D.C., by the Oak Ridge Natl.Lab., Oak Ridge, TN:32 p.	1984
Simazine	Cyanobium sp.	Algae	Salt water	3	NOEC	Population	0.0125	Ecotoxicology25(10): 1751-1758	2016
Simazine	Elodea canadensis	Flowers, Trees, Shrubs, Ferns	Fresh water	14	NOEC	Growth	0.083	Environ. Pollut.158:615-623	2010
Simazine	Glyceria maxima	Flowers, Trees, Shrubs, Ferns	Fresh water	56	NOEC	Growth	0.083	Environ. Pollut.158:615-623	2010
Simazine	Myriophyllum aquaticum	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Growth	1.5	J. Environ. Qual.31(6): 2096-2103	2002
Simazine	Myriophyllum spicatum	Flowers, Trees, Shrubs, Ferns	Fresh water	56	NOEC	Development	0.05	Environ. Pollut.158:615-623	2010
Simazine	Persicaria amphibia	Flowers, Trees, Shrubs, Ferns	Fresh water	84	NOEC	Growth	0.083	Environ. Pollut.158:615-623	2010
Simazine	Pontederia cordata	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Growth	0.3	Weed Sci.48:701-709	2000
Simazine	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.032	Ecotoxicology20(6): 1167-1175	2011
Simazine	Raphidocelis subcapitata	Algae	Fresh water	3	NOEC	Population	0.1	Chemosphere58(5): 571-578	2005
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	NOEC	Population	0.1	ASTM Spec. Tech. Publ.:69-84	1990
Simazine	Raphidocelis subcapitata	Algae	Fresh water	4	NOEC	Population	0.1	Interagency Agreement No.40-1067-80, Prepared for the U.S.EPA, Washington, D.C., by the Oak Ridge Natl.Lab., Oak Ridge, TN:32 p.	1984
Simazine	Skeletonema marinoi	Algae	Salt water	9	NOEC	Population	0.005	Aquat. Toxicol.147:112-120	2014
Simazine	Typha latifolia	Flowers, Trees, Shrubs, Ferns	Fresh water	7	NOEC	Growth	0.3	Arch. Environ. Contam. Toxicol.39(3): 282-288	2000
Simazine	Vallisneria americana	Flowers, Trees, Shrubs, Ferns	Fresh water	13	NOEC	Growth	0.058	Environ. Toxicol. Chem.29(1): 201-211	2010

Table S6 Acute and chronic toxicity values of potassium dichromate to algae and plants.

Species	EC_{50} and LC_{50} (μg/L)	N	Species	NOEC (μg/L)	N
Stephanodiscus hantzschii	0.51	1	*Chlorella sp.*	0.00010	1
Chlorella sp.	0.95	2	*Gracilaria tenuistipitata*	40	1
Euglena gracilis	117	1	*Raphidocelis subcapitata*	49	3
Galdieria sulphuraria	141	2	*Lemna minor*	50	1
Gomphonema parvulum	150	1	*Lemna gibba*	100	1
Navicula seminulum	187	1	*Ectocarpus siliculosus*	431	1
Nitzschia linearis	208	1	*Ulva aragoënsis*	524	1
Lemna aequinoctialis	285	2	*Skeletonema costatum*	1,000	1
Scenedesmus pannonicus	318	1	*Cyanobium* sp.	1,760	1
Desmodesmus subspicatus	350	1	*Gracilaria* sp.	2,200	1
Chlorella pyrenoidosa	354	1	*Lemna aequinoctialis*	5,884	1
Oscillatoria agardhii	354	11			
Microcystis aeruginosa	389	5			
Anacystis aeruginosa	389	1			
Parachlorella kessleri	575	1			
Gracilaria tenuistipitata	600	1			
Synechocystis sp.	650	2			
Raphidocelis subcapitata	650	1			
Selenastrum capricornutum	760	1			
Chlamydomonas reinhardtii	813	1			

Chlorella vulgaris	880	1
Ulva aragoënsis	956 *	1
Lemna gibba	1,148	1
Scenedesmus quadricauda	1,590	2
Stichococcus bacillaris	1,642	1
Ectocarpus siliculosus	1770 *	1
Synechococcus leopoliensis	3,308	1
Undaria pinnatifida	3400 *	1
Spirodela polyrrhiza	3,500	1
Cyanobium sp.	4,610	1
Skeletonema costatum	14,700	1
Lemna minor	26,980	1

EC50, the 50% effective concentration; LC50, the 50% lethal concentration; NOEC, no observed effect concentration; N, number of data. * Toxicity values are in the present study. The geometric mean was presented the species for which the toxicity values had been previously reported (Table S5).

Table S7 Acute and chronic toxicity values of 3,5-dichlorophenol to algae and plants.

Species	EC_{50} and LC_{50} (μg/L)	N	Species	NOEC (μg/L)	N
Undaria pinnatifida	422*	1	*Undaria pinnatifida*	79*	1
Ectocarpus siliculosus	814*	1	*Raphidocelis subcapitata*	380	1
Myriophyllum aquaticum	1,537	2	*Ulva aragoënsis*	447*	1
Ulva aragoënsis	1,620*	1	*Ectocarpus siliculosus*	450*	1
Cyanobium sp.	1,710	1	*Cyanobium* sp.	625	1
Raphidocelis subcapitata	2,097	7	*Lemna minor*	782	2
Lemna aequinoctialis	2,711	2	*Myriophyllum aquaticum*	1,800	1
Desmodesmus subspicatus	3,219	3			
Lemna minor	4,679	2			

EC50, the 50% effective concentration; LC50, the 50% lethal concentration; NOEC, no observed effect concentration; N, number of data. * Toxicity values are in the present study. The geometric mean was presented the species for which the toxicity values had been previously reported (Table S5).

Table S8 Acute and chronic toxicity values of diuron to algae and plants.

Species	EC_{50} and LC_{50} (μg/L)	N	Species	NOEC (μg/L)	N
Apium nodiflorum	0.00026	1	*Chara vulgaris*	0.00050	1
Chara vulgaris	0.35	1	*Myriophyllum spicatum*	0.0	1
Coccolithus huxleyi	2.3	1	*Apium nodiflorum*	0.1	1
Gomphonema sp.	3.0	1	*Synechococcus* sp.	0.2	1
Ceramium tenuicorne	3.4	1	*Nitzschia pungens*	0.3	1
Navicula sp.	3.7	1	*Coccolithus huxleyi*	0.5	1
Thalassiosira pseudonana	4.3	1	*Chlamydomonas reinhardtii*	0.8	1
Chlorella pyrenoidosa	4.5	3	*Gracilaria tenuistipitata*	1.3	1
Chroococcus minor	4.7	1	*Ectocarpus siliculosus*	1.8*	1
Myriophyllum spicatum	5.0	1	*Entomoneis punctulata*	2.0	1
Nephroselmis pyriformis	5.8	1	*Nitzschia closterium*	2.0	1
Skeletonema costatum	5.9	1	*Ulva aragoënsis*	2.2*	1
Fragilaria capucina	6.0	2	*Chlorella pyrenoidosa*	2.3	1
Ankistrodesmus sp.	6.0	1	*Chroomonas acuta*	5.0	1
Dictyosphaerium pulchellum	6.0	1	*Cryptomonas* sp.	5.0	1
Ectocarpus siliculosus	6.0*	1	*Gomphonema gracile*	5.0	1
Nitzschia pungens	6.6	1	*Oocystis naegelii*	5.0	1
Chlorococcum sp.	7.1	2	*Planothidium lanceolatum*	5.0	1
Synechococcus sp.	7.8	2	*Desmodesmus subspicatus*	7.0	1
Spirulina platensis	8.5	1	*Raphidocelis subcapitata*	9.4	1

Ulva aragoënsis	9.2*	1
Lemna aequinoctialis	9.2	2
Lemna gibba	9.4	1
Dunaliella tertiolecta	10	3
Chlorella vulgaris	10	3
Chlorella fusca	10	2
Isochrysis galbana	10	1
Lemna sp.	11	1
Raphidocelis subcapitata	12	8
Scenedesmus quadricauda	12	2
Anabaena variabilis	13	2
Scenedesmus acutus	14	6
Phaeodactylum tricornutum	14	2
Lemna perpusilla	15	1
Gracilaria tenuistipitata	15	1
Nitzschia closterium	17	1
Lemna minor	19	3
Selenastrum capricornutum	23	3
Entomoneis punctulata	24	1
Chlorococcum hypnosporum	25	1
Navicula forcipata	25	1
Oscillatoria chalybea	28	1
Chlamydomonas moewusii	6,993	1
Pyrocystis lunula	10,000	1

Cyclotella meneghiniana	34	2
Porphyridium aerugineum	35	1
Chaetoceros gracilis	36	1
Chlorella sp.	40	1
Oscillatoria	40	1
Spirodela polyrrhiza	41	1
Desmodesmus subspicatus	41	2
Ulnaria ulna	46	2
Encyonema gracile	47	1
Gomphonema clavatum	48	1
Encyonema silesiacum	50	2
Chlamydomonas moewusii	54	6
Achnanthidium minutissimum	78	2
Fistulifera saprophila	91	1
Fragilaria crotonensis	210	1
Mayamaea fossalis	254	2
Gomphonema gracile	395	1
Anabaena doliolum	400	1
Cymbella sp.	438	1
Oscillatoria laetevirens	490	1
Hormidium flaccidum	500	1
Ulothrix fimbriata	540	1

Stichococcus sp.	1,500	1
Craticula accomoda	1,572	2
Nitzschia palea	1,602	2
Gomphonema parvulum	1,791	2
Sellaphora minima	2,606	1
Eolimna minima	4,236	1
Hormosira banksii	5,408	2
Pyrocystis lunula	19,000	1

EC50, the 50% effective concentration; LC50, the 50% lethal concentration; NOEC, no observed effect concentration; N, number of data. * Toxicity values are in the present study. The geometric mean was presented the species for which the toxicity values had been previously reported (Table S5).

Table S9 Acute and chronic toxicity values of simazine to algae and plants.

Species	EC_{50} and LC_{50} (μg/L)	N	Species	NOEC (μg/L)	N
Spirulina platensis	6.0	1	*Chlorella fusca*	3.7	1
Oscillatoria sp.	8.2	1	*Skeletonema marinoi*	5.0	1
Gomphonema sp.	34	1	*Cyanobium sp.*	13	1
Anabaena flosaquae	36	1	*Ulva aragoënsis*	16	1
Selenastrum sp.	49	1	*Ectocarpus siliculosus*	35	1
Lemna aequinoctialis	56	1	*Myriophyllum spicatum*	50	1
Chlorella fusca	64	2	*Vallisneria americana*	58	1
Vallisneria americana	67	1	*Raphidocelis subcapitata*	75	1
Ankistrodesmus sp.	87	1	*Elodea canadensis*	83	1
Chlorella pyrenoidosa	88	3	*Glyceria maxima*	83	1
Ectocarpus siliculosus	88	1	*Persicaria amphibia*	83	1
Hormidium flaccidum	90	1	*Chlorella vulgaris*	100	1
Navicula pelliculosa	90	1	*Pontederia cordata*	300	1
Scenedesmus quadricauda	99	2	*Typha latifolia*	300	1
Ulva aragoënsis	102	1	*Myriophyllum aquaticum*	1,500	1
Cyanobium sp.	105	1			
Synechococcus leopoliensis	120	1			
Chlorococcum sp.	126	2			
Encyonema gracile	145	1			
Anabaena circinalis	160	1			
Lemna gibba	167	3			
Lemna minor	176	3			
Stichococcus sp.	200	1			
Raphidocelis subcapitata	228	1 1			
Gomphonema gracile	288	1			
Scenedesmus acutus	321	2			
Eunotia sudetica	330	1			
Ulva pertusa	378	1			
Lemna sp.	422	1			
Chlamydomonas noctigama	450	1			
Cryptomonas pyrenoidifera	500	1			

Isochrysis galbana	500	1
Microcystis aeruginosa	500	1
Phaeodactylum tricornutum	539	2
Skeletonema costatum	600	1
Chlamydomonas geitleri	746	1
Cyclotella sp.	800	1
Scenedesmus sp.	1,498	1
Chlorella sp.	2,072	2
Chlorella vulgaris	2,174	1
Dunaliella tertiolecta	2,361	2
Anabaena variabilis	7,400	1
Dictyosphaerium pulchellum	28,000	1

EC50, the 50% effective concentration; LC50, the 50% lethal concentration; NOEC, no observed effect concentration; N, number of data. * Toxicity values are in the present study. The geometric mean was presented the species for which the toxicity values had been previously reported (Table S5).

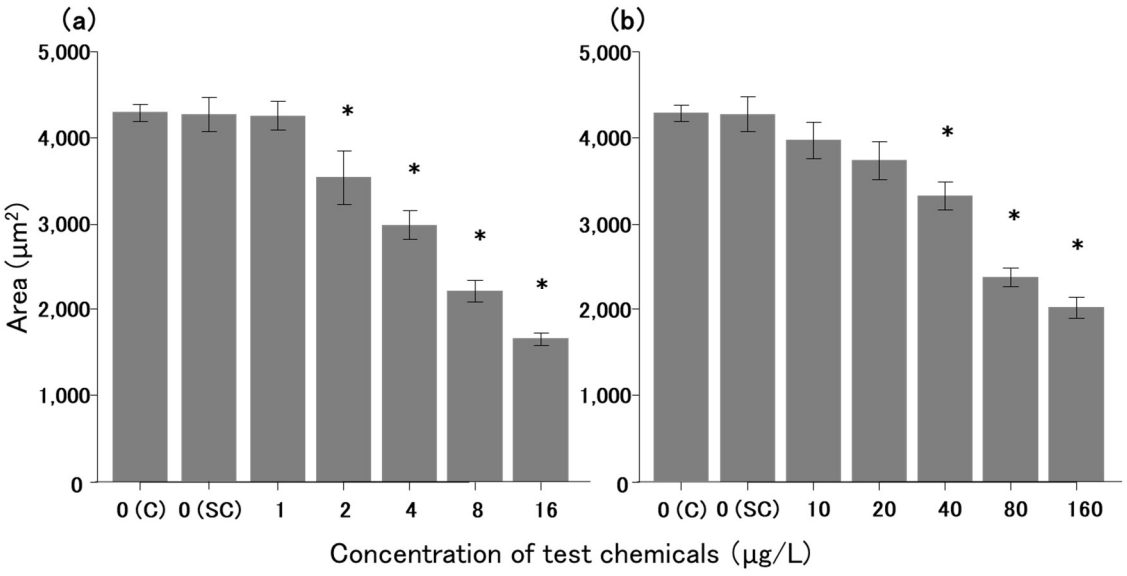

Fig. S1 Effect of (a) diuron and (b) simazine on the area of the germinated zoospore of *Ulva aragoënsis* for 3 days. C and SC indicate the control group and solvent control group, respectively. Asterisk (*) indicates a significant difference ($p < 0.05$) from the control. The error bar indicates the standard error (N = 4).

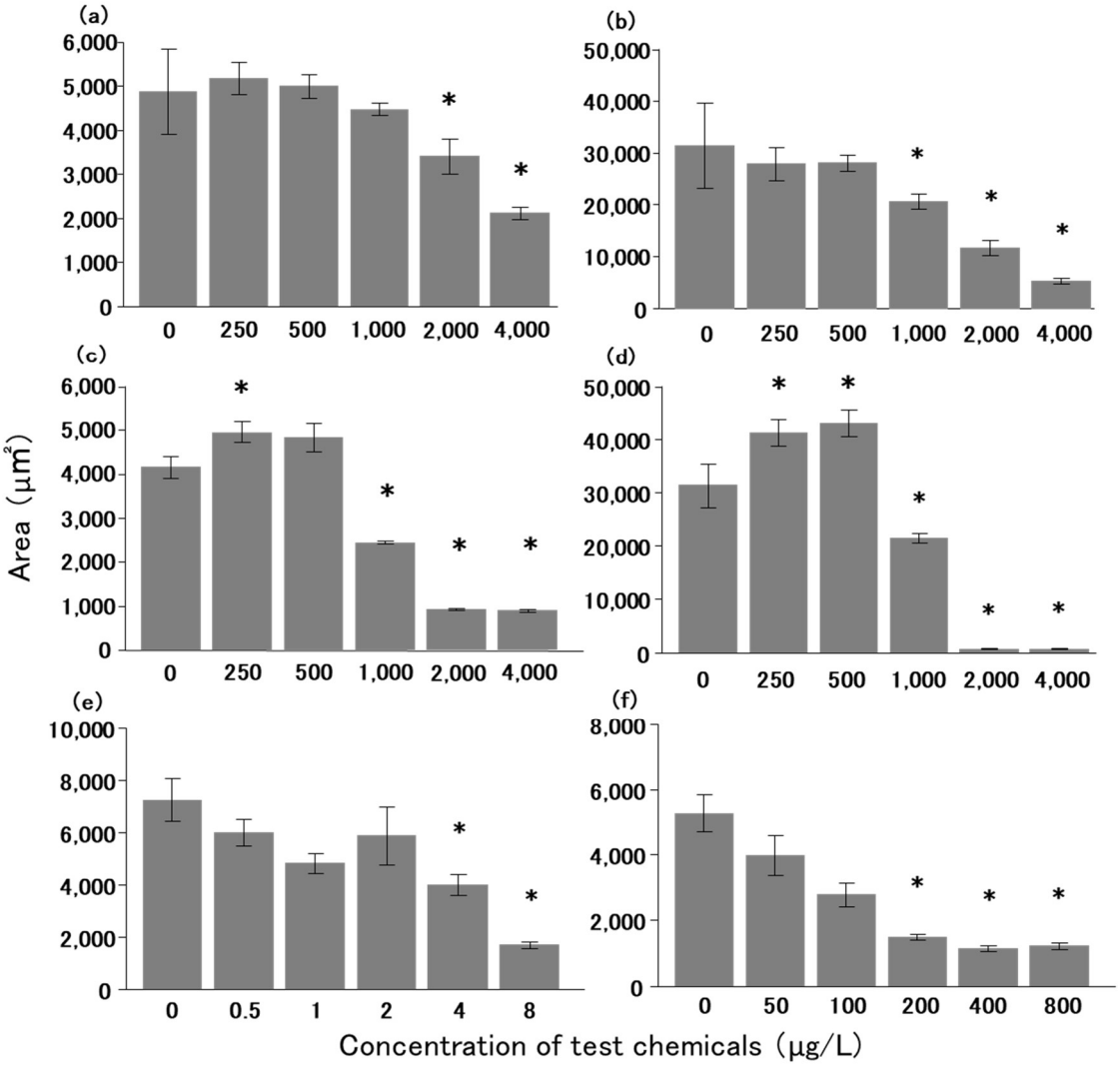

Fig. S2 Effect of (a, b) potassium dichromate, (c, d) 3,5-dichlorophenol, (e) diuron, and (f) simazine on the area of *Ectocarpus siliculosus* plumules for 7 days (a, c, e, f) or 10 days (b, d). C and SC indicate the control group and solvent control group, respectively. Asterisk (*) indicates a significant difference ($p < 0.05$) from the control. Error bar indicates the standard error (N = 4).

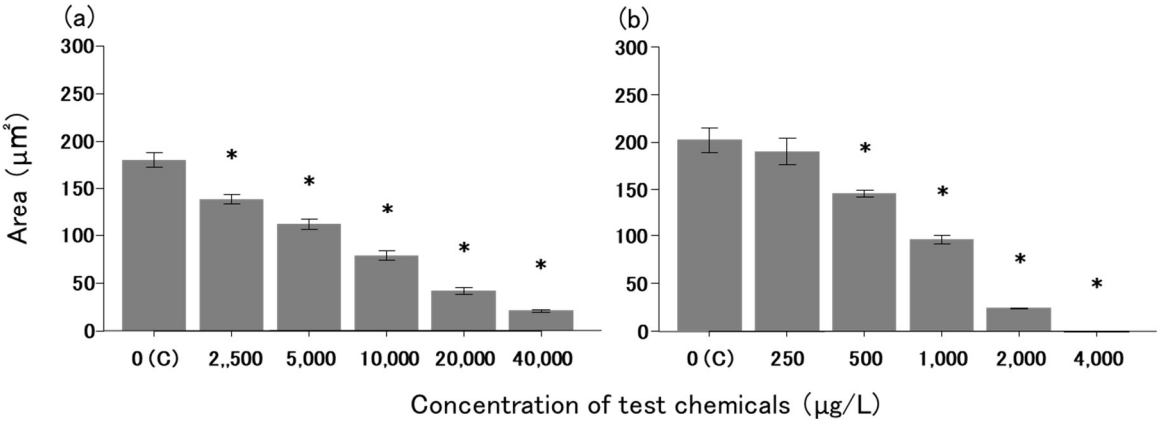

Fig. S3 Effect of (a) potassium dichromate and (b) 3,5-dichlorophenol on the area of plumules of *Undaria pinnatifida* for 7 days. Asterisk (*) indicates a significant difference ($p < 0.05$) from the control. The error bar indicates the standard error (N = 4).