Phase III: Diuron Criteria Report

Appendix

Data summary sheets

Section 1: Studies rated RR (p. A2-A39)
Section 2: Studies rated RL, LR, LL (p. A40-A179)
Section 3: Studies rated N (p. A180-A247)

Abbreviations used in this appendix:

n/a = Not applicable
NR = Not Reported
RR = Relevant, Reliable study

Unused lines deleted from tables

Within each section, studies are listed in alphabetical order by species name, when there are multiple summaries for one species, they are listed in alphabetical order by author.

Appendix

Section 1
Studies rated RR

Toxicity Data Summary

Chironomus tentans

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 97
Rating: R

Reference	**Nebeker and Schuytema 1998**	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironimidae	
Genus	*Chironomus*	
Species	*Tentans*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-day first instar larvae	
Source of organisms	ARS, Hampton NH	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	10-d	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	9.0 ± 0.2 of 10 organisms	From 3 reps
Effect 2	Larval weight at end	
Control response 2	0.5 ± 0 mg	From 3 reps with 10 animals/rep
Temperature	24° C	
Test type	10-d Static renewal	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.9 ± 0.1	
Hardness	24 ± 1 mg/L	
Alkalinity	26 ± 1 mg/L	
Conductivity	78 ± 1 µs/cm	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker and Schuytema 1998**	***C. tentans***
Parameter	**Value**	**Comment**
Dissolved Oxygen	6.6-7.2 mg/L	
Feeding	1st day: Algal culture, fed daphnia food starting on Day 3	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	12.2 ± 1.5 mg/L	3 reps, 10 per rep
Concentration 2 Meas	7.1 mg/L	3 reps, 10 per rep
Concentration 3 Meas	3.4 mg/L	3 reps, 10 per rep
Concentration 4 Meas	1.9 ± 0.4 mg/L	3 reps, 10 per rep
Control	0	3 reps, 10 per rep
LC50; calculation method	10-d LC50: 3.3mg/L (2.4-4.5)	Method: Trimmed Spearman-Karber
NOEL; calculation method, significance level (p-value) and minimum significant difference (MSD)	1.9 mg/L – based on mortality 3.4 mg/L – based on reduced weight	Method: Dunnett's Multiple Comparison, EPA p ≤0.05 MSD: NR
LOAEL	3.4 mg/L – based on mortality 7.1 mg/L – based on reduced weight	Method: Dunnett's Multiple Comparison, EPA p ≤0.05
MATC (GeoMean NOEC, LOEC)	2.54 mg/L – based on mortality 4.91 mg/L – based on reduced weight	

Notes:
Reliability Point Losses Table 3.7: -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Daphnia magna

Study: Baer, KN. 1991a. Static, Acute 48-hour EC50 of DPX-14740-165 (Karmex DF) to *Daphnia magna*. EPA MRID 420460-03. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE.

Relevance
Score: 100
Rating: R

Reliability
Score: 91.5
Rating: R

Reference	**Baer 1991a**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Diplostraca	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Neonates (<24h old) from 28d old parents	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not Reported	
Test duration	48h	
Data for multiple times?	Yes	
Effect 1	Immobility	
Control response 1	10% immobile at 48h	
Temperature (°C)	19.9 (mean)	
Test type	Static	Unaerated
Photoperiod/light intensity	16h light	
Dilution water	Lab well water	
pH	8.0-8.3	Meas. at 0 and 48h in 1 rep of each conc.
Hardness	78 mg/L as CaCO3	
Alkalinity	80 mg/L as CaCO3	
Conductivity	170 µmhos/cm	
Dissolved Oxygen	8.2-8.7 mg/L	Meas. at 0 and 48h in 1 rep of each conc.
Feeding	None during test	

Appendix, Section 1: Studies rated RR

Reference	**Baer 1991a**	***D. magna***
Parameter	**Value**	**Comment**
Purity of test substance	80% of formulation	20% inert ingredients
Concentrations measured?	Yes	
Measured is what % of nominal?	10-95%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom*/Meas (mg/L)	5.0/3.8	4 reps with 5 daphnids each
Concentration 2 Nom*/Meas (mg/L)	8.4/6.3	4 reps with 5 daphnids each
Concentration 3 Nom*/Meas (mg/L)	14/9.7	4 reps with 5 daphnids each
Concentration 4 Nom*/Meas (mg/L)	23/13	4 reps with 5 daphnids each
Concentration 5 Nom*/Meas (mg/L)	39/16	4 reps with 5 daphnids each
Concentration 6 Nom*/Meas (mg/L)	65/17	4 reps with 5 daphnids each
Concentration 7 Nom*/Meas (mg/L)	108/19	4 reps with 5 daphnids each
Concentration 8 Nom*/Meas (mg/L)	180/20	4 reps with 5 daphnids each
Concentration 9 Nom*/Meas (mg/L)	300/24	4 reps with 5 daphnids each
Control	Dilution water	4 reps with 5 daphnids each
EC50 (24 h); calculation method	EC50=68 mg/L 95% fiducial interval: 55-86 mg/L, slope: 2.8, y-int: -0.19	Based on nominal total formulation conc. Method:
EC50 (48 h); calculation method	EC50=12 mg/L 95% fiducial interval: 10-13 mg/L, slope: 7.0, y-int: -2.5	Based on nominal total formulation conc.

Other notes:

- Although concentrations were measured, only 2 of the 4 reps were analyzed, and therefore the point estimates could not be re-calculated based on measured concentrations.
- All test concentrations (excluding controls) were cloudy with undissolved test substance slowly settling to the bottom of the test vessels during the exposure period. Undissolved solids are present in the formulation (inert ingredients). Measured concentrations are based on analysis of settled test solutions where the active ingredient sorbs to the settled undissolved solids present in the formulation, particularly at concentrations near or above the approximately 40 ppm solubility.

Reliability Point Losses Table 3.7: -8 hypothesis tests
Reliability Point Losses Table 3.8: -4 meas conc NR, -4 water solubility, -3 hypothesis tests

Toxicity Data Summary

Daphnia pulex

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 93
Rating: R

Reference	**Nebeker and Schuytema 1998**	***D. pulex***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*pulex*	
Family in North America?	Yes	
Age/size at start of test/growth phase	5-day	
Source of organisms	Small ponds in Corvallis Oregon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	7-d chronic, 96-h acute	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	100%	
Effect 2	# young produced	
Control response 2	36.7 ± 1.3	
Temperature	NR	
Test type	7-d Static	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.9 ± 0.1	
Hardness	24 ± 1 mg/L	
Alkalinity	26 ± 1 mg/L	
Conductivity	78 ± 1 µs/cm	
Dissolved Oxygen	7.4-8.0 mg/L	
Feeding	100-150µl fish food and yeast slurry	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker and Schuytema 1998**	***D. pulex***
Parameter	**Value**	**Comment**
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Not Reported	
Concentration 1 Meas	17.8 mg/L	3 reps, 5 per rep
Concentration 2 Meas	7.7 ± 0.6mg/L	3 reps, 5 per rep
Concentration 3 Meas	4.0 mg/L	3 reps, 5 per rep
Concentration 4 Meas	1.9 ± 0.1 mg/L	3 reps, 5 per rep
Concentration 5 Meas	0.9 mg/L	3 reps, 5 per rep
Concentration 6 Meas	0.4 mg/L	3 reps, 5 per rep
Control	0	3 reps, 5 per rep
LC50; indicate calculation method	96-h: 17.9 (14.2-22.6) 7-d: 7.1 (5.8-8.8) mg/L	Trimmed Spearman-Karber
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	7-d: 4.0 mg/L	Method: Dunnett's Multiple Comparison, EPA $p \leq 0.05$ Based on mortality and reduced # of young
LOAEL; indicate calculation method	7-d: 7.7 mg/L	Method: Dunnett's Multiple Comparison, EPA $p \leq 0.05$ Based on mortality and reduced # of young
MATC (GeoMean NOEC, LOEC)	5.55 mg/L	

Notes:
Reliability Point Losses Table 3.7: -4 Temperature not reported, -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -6 Temperature not reported, -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Hyalella azteca

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 97
Rating: R

Reference	**Nebeker & Schuytema 1998**	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*Azteca*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-day neonates	
Source of organisms	Wetlands at Oregon Dept. Fish and Wildlife Refuge	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	10-d chronic, 96-h acute	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	100%	
Effect 2	Growth	
Control response 2	Length 2.3 mm, Wet weight 0.2 ± 0.1	
Temperature	22° C	
Test type	10-d Static renewal	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.9 ± 0.1	
Hardness	24 ± 1 mg/L	
Alkalinity	26 ± 1 mg/L	
Conductivity	78 ± 1 µs/cm	
Dissolved Oxygen	6.6-7.2 mg/L	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker & Schuytema 1998**	***H. azteca***
Parameter	**Value**	**Comment**
Feeding	Brine shrimp, daphnia food, rabbit food	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	28.5 ± 1.0 mg/L	3 reps, 5 per rep
Concentration 2 Meas	22.9 mg/L	3 reps, 5 per rep
Concentration 3 Meas	15.7 ± 0.3 mg/L	3 reps, 5 per rep
Concentration 4 Meas	7.9 mg/L	3 reps, 5 per rep
Concentration 5 Meas	4.2 ± 0.1 mg/L	3 reps, 5 per rep
Control	0	3 reps, 5 per rep
LC50; indicate calculation method	96-h: 19.4 (17.7-21.3) 10-d: 18.4 (16.5-20.5)	Trimmed Spearman-Karber
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	10-d : 7.9 mg/L	Method: Dunnett's Multiple Comparison, EPA p: ≤0.05 Based on mortality and reduced weight
LOAEL; indicate calculation method	10-d: 15.7 mg/L	Method: Dunnett's Multiple Comparison, EPA p: ≤0.05 Based on mortality and reduced weight
MATC (GeoMean NOEC, LOEC)	11.14 mg/L	

Notes:
Reliability Point Losses Table 3.7: -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Lemna gibba

Study: Ferrell BD. 2006. Diuron (DPX-14740) technical: Static, 7-day growth inhibition toxicity test with *Lemna gibba* G3. DuPont Haskell Laboratory for Health and Environmental Sciences. Newark, DE. MRID 46996701.

Relevance
Score: 100
Rating: R

Reliability
Score: 85.5
Rating: R

Reference	**Ferrell 2006**	***L. gibba***
Parameter	**Value**	**Comment**
Test method cited	OECD 2006, EPA 1996	
Phylum	Magnoliophyta	
Class	Liliopsida	
Order	Arales	
Family	Lemnaceae	
Genus	*Lemna*	
Species	*gibba*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Plant with 4 fronds	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	7-d	
Data for multiple times?	No	
Effect 1, 2	Frond count	Frond count yield
Control response 1, 2	145 Increased by ≥ a factor of 7, doubling time 1.95 d	133
Effect 3, 4	Biomass	Biomass yield
Control response 3, 4	13.3 mg	12.23 mg
Effect 5, 6	Growth rate based on frond count (in fronds)	Growth rate biomass (in fronds)
Control response 5, 6	0.3559	0.3600
Temperature	24.7 ± 0.5 °C	
Test type	Static	
Photoperiod/light intensity	24 h L, 5956 (5570-6870) lux	
Dilution water	20-strength synthetic algal-assay procedure nutrient medium	
pH	7.57 (7.87-9.01)	
Hardness	NR	
Alkalinity	NR	

Appendix, Section 1: Studies rated RR

Reference	**Ferrell 2006**	***L. gibba***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, incorporated in dilution water	
Purity of test substance	99.1%	
Concentrations measured?	Yes	
Measured is what % of nominal?	64-78%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, HPLC/UV	
Concentration of carrier (if any) in test solutions	none	
Concentration 1 Nom/Meas (µg/L)	1.25/0.795	4 reps and 3 plants
Concentration 2 Nom/Meas (µg/L)	3.75/2.47	Reps and # per
Concentration 3 Nom/Meas (µg/L)	11.3/8.11	Reps and # per
Concentration 4 Nom/Meas (µg/L)	33.9/25.8	Reps and # per
Concentration 5 Nom/Meas (µg/L)	102/79.1	Reps and # per
Control	Dilution water	Reps and # per
EC_{50} (µg/L)	Biomass: 15.7 (10.6-20.8) Biomass yield: 14.4 (9.26-19.6) Frond count: 19.1 (13.4-24.8) Fond count yield: 17.5 (11.8-23.2)	Method: linear regression
NOEC (µg/L)	Biomass: 2.47 Biomass yield: 2.47 Frond count: 8.11 Frond count yield: 8.11 Growth rate, frond count: 8.11 Growth rate, biomass: 2.47	Method: Jonckheere-Terpstra p: 0.05 MSD: NR
LOEC (µg/L)	Biomass: 8.11 Biomass yield 8.11 Frond count: 25.8 Frond count yield: 25.8 Growth rate, frond count: 25.8 Growth rate, biomass: 8.11	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	Biomass: 4.48 Biomass yield: 4.48 Growth rate, biomass: 4.48	
% of control at NOEC	Biomass: 100% Biomass yield: 100% Growth rate, biomass: 99.9%	
% of control at LOEC	Biomass: 83.1%	

Appendix, Section 1: Studies rated RR

Reference	**Ferrell 2006**	***L. gibba***
Parameter	**Value**	**Comment**
	Biomass yield: 81.7% Growth rate, biomass: 92.7%	

Notes:

*Definitions of endpoints given in study:
Frond count or biomass: inhibition of growth based on the 0-7 d healthy frond count or biomass relative to the control.
Healthy frond count yield or biomass yield: inhibition of growth based on the 0-7 d healthy frond count yield (final-initial) or biomass yield (final-initial) relative to the control.
Growth rate: inhibition of growth based on the 0-7 d growth rate based on healthy frond count or based on biomass relative to the control.

-Recovery data indicated that diuron was phytostatic.
-Diuron stability over 7 d was demonstrated

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Minimum significant difference (2).
Acceptability: Measured concentrations within 20% of nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Minimum significant difference (1).

Toxicity Data Summary

Lumbriculus variegatus

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 97
Rating: R

Reference	**Nebeker & Schuytema 1998**	***L. variegatus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Annelida	
Class	Clitellata	
Order	Lumbriculida	
Family	Lumbriculidae	
Genus	*Lumbriculus*	
Species	*Variegates*	
Family in North America?	Yes	
Age/size at start of test/growth phase	"small, short adults"	
Source of organisms	Collected @ ponds from EPA, Corvallis OR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	10-d	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	100%	
Effect 2	Blotted wet weight	
Control response 2	8.8 ± 0.3 mg	
Temperature	23° C	
Test type	Static 10-d renewal	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.8 ± 0.1	
Hardness	23 ± 2 mg/L	
Alkalinity	25 ± 1 mg/L	
Conductivity	75 ± 5 µs/cm	
Dissolved Oxygen	NR	
Feeding	Frozen fish food ad lib.	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker & Schuytema 1998**	***L. variegatus***
Parameter	**Value**	**Comment**
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	29.1 mg/L	3 reps, 10 per rep
Concentration 2 Meas	22.8 ± 3.2 mg/L	3 reps, 10 per rep
Concentration 3 Meas	13.0 ± 1.0 mg/L	3 reps, 10 per rep
Concentration 4 Meas	7.1 mg/L	3 reps, 10 per rep
Concentration 5 Meas	3.5 ± 0.1 mg/L	3 reps, 10 per rep
Concentration 6 Meas	1.8 ± 0.3 mg/L	3 reps, 10 per rep
Concentration 7 Meas	0.4 mg/L	3 reps, 10 per rep
Control	0	3 reps, 10 per rep
LCx; indicate calculation method	No LC50 b/c 100% survival	But effects on weight occurred at >3.5 mg/L
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	1.8 mg/L	Method: Dunnett's p: ≤0.05 Based on reduced weight
LOAEL; indicate calculation method	3.5 mg/L	Method: Dunnett's p: ≤0.05 Based on reduced weight
MATC (GeoMean NOEC,LOEC)	2.51 mg/L	

Notes:
Reliability Point Losses Table 3.7: -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Physa gyrina

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 97
Rating: R

Reference	**Nebeker & Schuytema 1998**	***P. gyrina***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Mollusca	
Class	Gastropoda	
Order	Basommatophora	
Family	Physidae	
Genus	*Physa*	
Species	*gyrina*	
Family in North America?	Yes	
Age/size at start of test/growth phase	15-day old snails, 1-1.5 mm diameter	
Source of organisms	ARS, Hampton NH	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	10-d	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	9.0 ± 0.2 of 10 snails	Ranged 8.7-10 for 6 exposure levels
Effect 2	Wet weight at end	
Control response 2	5.3 ± 0.1 mg	Ranged 0.4-3.7 mg for 6 exposures
Temperature	23° C	
Test type	10-d Static renewal	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.9 ± 0.1	
Hardness	24 ± 1 mg/L	
Alkalinity	26 ± 1 mg/L	
Conductivity	78 ± 1 µs/cm	
Dissolved Oxygen	6.6-7.2 mg/L	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker & Schuytema 1998**	***P. gyrina***
Parameter	**Value**	**Comment**
Feeding	1st day: Algal culture, fed daphnia food starting on Day 3	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	29.1 mg/L	3 reps, 10 per rep
Concentration 2 Meas	22.8 ± 3.1 mg/L	3 reps, 10 per rep
Concentration 3 Meas	13.4 ± 1.1 mg/L	3 reps, 10 per rep
Concentration 4 Meas	7.6 mg/L	3 reps, 10 per rep
Concentration 5 Meas	3.5 ± 0.1 mg/L	3 reps, 10 per rep
Concentration 5 Meas	1.8 ± 0.3 mg/L	3 reps, 10 per rep
Control	0	3 reps, 10 per rep
LC50; indicate calculation method	Not calculable	Trimmed Spearman-Karber
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	13.4 mg/L	Method: Dunnett's Multiple Comparison, EPA $p \leq 0.05$ based on reduced weight
LOAEL; indicate calculation method	22.8 mg/L	Method: Dunnett's Multiple Comparison, EPA $p \leq 0.05$ Based on reduced weight
MATC (GeoMean NOEC,LOEC)	17.5 mg/L	

Notes:
Reliability Point Losses Table 3.7: -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Pimephales promelas

Study: Call DJ, Brooke LT, and Kent RJ. 1983. Toxicity, Bioconcentration and Metabolism of 5 Herbicides in Freshwater Fish, EPA # 452601029. Environmental Research Laboratory-Duluth. *Same as Call *et al.* 1987.

Relevance
Score: 82.5 (acute), 90 (chronic)*
Rating: L (acute), R (chronic)

Reliability
Score: 82
Rating: R

*Acute: no standard method, no control response, Chronic: no standard method
Note: Report page numbers cited refer to upper right hand corner page number

Reference	**Call *et al.* 1983**	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	Fathead minnow
Family in North America?	Yes	
Age/size at start of test/growth phase	Acute: 30-d Chronic: eggs >24-h	
Source of organisms	US EPA Environmental Research Laboratory in Duluth	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Acute: 192-h Chronic: 54-60 days	
Data for multiple times?	Yes, 96-h acute data and others reported	
Effect 1	Acute Mortality	
Control response 1	NR	
Effect 2	Egg Hatchability	
Control response 2	67.9%	Ranged 66.1-77.9% for 5 exposure levels, no effect from Diuron
Effect 3	Mean # survivors after 64-d exposure (60 d post-hatch)	30 fry total in each rep
Control response 3	24.5	Ranged 7.5-28 for 5 exposure levels

Reference	**Call *et al.* 1983**	***P. promelas***
Parameter	**Value**	**Comment**
Effect 4	Mean % Abnormal and dead fry after 5-d exposure	
Control response 4	2.2%	Ranged 0.6-15% for 5 exposure levels
Effect 5	Mean wet weight after 64-d exposure (60-d post-hatch)	
Control response 5	0.568 g	Ranged 0.496-0.619 g for 5 exposure levels, no effect from diuron
Effect 6	Mean length after 64-d exposure (60-d post-hatch)	
Control response 6	32.2 mm	Ranged 29.1-32.4 mm for 5 exposure levels, no effect from diuron
Temperature	25°C	
Test type	Flow-through	Proportional diluter system
Photoperiod/light intensity	"normal lab lighting conditions", 2x40 watts fluorescent bulbs	
Dilution water	Lake Superior water	
pH	75 ± 0.1	
Hardness (mg/L as $CaCO_3$)	46.4 ± 2.2 (acute), 48.4 ± 4.3 (chronic)	
Alkalinity (mg/L as $CaCO_3$)	42.1 ± 2.0 (acute), 46.9 ± 2.9 (chronic)	
Conductivity	NR	
Dissolved Oxygen	Acute: 89.6-94.5% saturation Chronic: 89.9 – 92.9% saturation	
Feeding	Acute: No Chronic: tetramin and brine shrimp	
Purity of test substance	Technical grade 98.6%	
Concentrations measured?	Yes	
Measured is what % of nominal?	88.9% ± 6.0%	
Chemical method documented?	Extraction w/ methylene chloride and analysis by HPLC, Farrington et al (1977)	
Concentration of carrier (if any) in test solutions	0%	Generated from a sand column
Concentration 1 Meas	Acute: 5.54 mg/L Chronic: 2.6 µg/L	Acute: 20 per aquarium in duplicate reps Chronic: 30 per aquarium in duplicate reps

Appendix, Section 1: Studies rated RR

Reference	**Call *et al.* 1983**	***P. promelas***
Parameter	**Value**	**Comment**
Concentration 2 Meas	Acute: 7.94 mg/L Chronic: 6.1µg/L	Same as above
Concentration 3 Meas	Acute: 11.14 mg/L Chronic:14.5µg/L	Same as above
Concentration 4 Meas	Acute: 15.42 mg/L Chronic: 33.4 µg/L	Same as above
Concentration 5 Meas	Acute: 24.20 mg/L Chronic: 78.0 µg/L	Same as above
Control	0	Duplicates
LC50 (95% Confidence interval)	24 h: 23.3 (21.0-25.9) mg/L 48 h: 19.9 (19.5-20.4) mg/L 96-h: 14.2 (13.4-15.0) mg/L 192-h: 7.7 (6.0-9.9) mg/L	Method: NR p: 0.05
NOEC	33.4 µg/L	Method: NR
LOEC	78.0 µg/L	$p < 0.01$ for abnormal/dead after 5-d exposure $p < 0.05$ for survival after 64-d exposure (60-d post-hatch)

Reliability Point Losses Table 3.7: -3 measured conc NR, -2 conductivity NR, -3 photoperiod NR, -5 statistical methods NR, -4 hypothesis tests

Reliability Point Losses Table 3.8: -5 no std method, -4 measured conc NR, -1 random assignment NR, -3 temperature not +/- 1 deg C, -1 conductivity NR, -2 photoperiod NR, -2 random design NR, -2 statistical method NR, -2 hypothesis tests

Toxicity Data Summary

Pimephales promelas

Study: Call, DJ, Brooke, LT, Kent, RJ, Knuth, ML, Poirier, SH, Huot, JM, Lima, AR. 1987. Bromacil and Diuron Herbicides: Toxicity, Uptake, and Elimination in Freshwater Fish. *Archives of Environmental Contamination and Toxicology* 16:607-613. *Same as Call *et al.* 1983.

Relevance
Score: 82.5 (acute), 90 (chronic)
Rating: L (acute), R (chronic)

Reliability
Score: 84.5
Rating: R

*Acute: no standard method, no control response, Chronic: no standard method

Reference	**Call *et al.* 1987**	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	EPA	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	Fathead minnow
Family in North America?	Yes	
Age/size at start of test/growth phase	Acute: 30-d old Chronic: Eggs < 24-h, hatched fry	
Source of organisms	Lab culture	Environmental Research Laboratory-Duluth (USEPA)
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Acute: 24-192 h Chronic: 64-d	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Egg Hatchability	
Control response 2	67.9%	
Effect 3	Fish growth (length and wet weight) at 60-d post-hatch	
Control response 3	32.2 mm, 0.568 g	
Effect 4	Mortality and deformity	
Control response 4	2.2%	
Effect 5	Survival at 60-d post-hatch	
Control response 5	24.5 fish of 30	

Appendix, Section 1: Studies rated RR

Reference	**Call *et al.* 1987**	***P. promelas***
Parameter	**Value**	**Comment**
Temperature (°C)	Acute: 24.3 Chronic: 25	
Test type	FT	
Photoperiod/light intensity	NR	
Dilution water	Lake Superior water	
pH	7.4	
Hardness	47.4 ± 2.8 mg/L as CaCO3	
Alkalinity	43 ± 2.3 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Acute:88.6-94.5% saturation Chronic: 91.2 ± 1.5% sat.	
Feeding	Acute: none Chronic: tetramin/brine shrimp	
Purity of test substance	96.8%	
Concentrations measured?	Yes	At 0 and 120 h
Measured is what % of nominal?	88.9% ± 6.0%	
Chemical method documented?	Yes	Spectrophotometric
Concentration of carrier (if any) in test solutions	0.01% acetone or less	
Concentration 1 Meas	Acute: 5.54 ± 0.47 mg/L Chronic: 2.6 ± 0.7 µg/L	
Concentration 2 Meas	Acute: 7.94 ± 0.43 mg/L Chronic: 6.1 ± 1.6 µg/L	
Concentration 3 Meas	Acute: 11.1± 0.88 mg/L Chronic: 14.5 ± 2.0 µg/L	
Concentration 4 Meas	Acute: 16.4 ± 0.76 mg/L Chronic: 33.4 ± 4.8 µg/L	
Concentration 5 Meas	Acute: 24.2 ± 0.23 mg/L Chronic: 78.0 ± 8.1 µg/L	
Control	Dilution water control, Solvent control (acetone)	
LC50; indicate calculation method	24 h: 23.3 mg/L 48 h: 19.9 mg/L 96 h: 14.2 mg/L 192 h: 7.7 mg/L	Method; NR
NOEC	33.4 µg/L	Method: NR
LOEC	78.0 µg/L	Method: NR
MATC (geomean of NOEC, LOEC)	51.0 µg/L	

Reliability Point Losses Table 3.7: -5 organism source NR, -3 nominal conc NR, -2 conductivity NR, -3 photoperiod NR, - MSD NR

Reliability Point Losses Table 3.8: -4 measured conc NR, -1 random assignment NR, -2 #/rep NR, -3 temperature not +/- 1 deg C, -1 conductivity NR, -2 photoperiod NR, -2 random design NR, -1 MSD NR

Toxicity Data Summary

Pimephales promelas

Study: Nebeker AV, Schuytema GS. 1998. Chronic effects of the herbicide diuron on freshwater cladocerans, amphipods, midges, minnows, worms, and snails. *Archives of Environmental Contamination and Toxicology* 35:441-446.

Relevance
Score: 100
Rating: R

Reliability
Score: 97
Rating: R

Reference	**Nebeker & Schuytema 1998**	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1997	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Embryo/Larval (E/L): 2.5 d Juvenile (J): 1.5 months	
Source of organisms	USEPA, Corvallis OR lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	E/L: 7-d; J: 10-d	
Data for multiple times?	No	
Effect 1	J: Survival	
Control response 1	100%	
Effect 2	J: Growth	
Control response 2	18.5mm, 50.9 mg	
Effect 3	Eggs hatched	
Control response 3	4.7 ± 0.1	
Effect 4	Embryo survival	
Control response 4	0.1	
Effect 5	Embryo growth	
Control response 5	0.1 mm, 0.7 mg	
Temperature	E/L: 25°C J: 24°C	
Test type	E/L: Static 7-d No renewal J: Static 10-d renewal	
Photoperiod/light intensity	NR	

Appendix, Section 1: Studies rated RR

Reference	**Nebeker & Schuytema 1998**	***P. promelas***
Parameter	**Value**	**Comment**
Dilution water	Well water	
pH	6.8 ± 0.1	
Hardness	23 ± 2 mg/L	
Alkalinity	25 ± 1 mg/L	
Conductivity	75 ± 5 µs/cm	
Dissolved Oxygen	NR	
Feeding	E/L: brine shrimp upon hatching J: brine shrimp, frozen fish food daily	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	E/L: 31.2 mg/L J: 27.1 mg/L	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
Concentration 2 Meas	E/L: 15.1 mg/L J: 20.0 mg/L	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
Concentration 3 Meas	E/L: 8.3 mg/L J: 12.2 ± 1.6 mg/L	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
Concentration 4 Meas	E/L: 4.2 mg/L J: 6.5 ± 0.5 mg/L	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
Concentration 5 Meas	E/L: 2.0, 1.0 mg/L J: 3.4 mg/L	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
Concentration 6 Meas	E/L: 1.0 mg/L	E/L:3 reps, 5 per rep
Control	0	E/L:3 reps, 5 per rep J: 3 reps, 4 per rep
LC50; indicate calculation method	E/L: 7-d 11.7 (10.1-13.5) mg/L J: 10-d 27.1 mg/L	
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	NOAEL: E/L: 4.2 mg/L J: 20.0 mg/L	Method: Dunnett's Mult. Comp., EPA p: ≤0.05
LOEC; indicate calculation method	LOAEL: E/L: 8.3 mg/L J: 27.1 mg/L	
MATC (GeoMean NOEC,LOEC)	E/L: 5.9 mg/L, J: 23.3	

Notes:
Embryo/Larval (E/L)
Juvenile (J)

Reliability Point Losses Table 3.7: -3 Photoperiod not actually reported, but likely followed that of ASTM method
Reliability Point Losses Table 3.8: -1 MSD not reported, -2 Photoperiod not reported

Toxicity Data Summary

Pseudacris regilla

Study: Schuytema GS, Nebeker AV. 1998. Comparative toxicity of diuron on Survival and growth of Pacific treefrog, bullfrog, red-legged frog, and African clawed frog embryos and tadpoles. *Archives of Environmental Contamination and Toxicology* 34:370-376.

Relevance
Score: 100
Rating: R

Reliability
Score: 89.5
Rating: R

Reference	**Schuytema and Nebeker 1998**	***P. regilla***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991 (embryo), 1997 (tadpole), Xenopus	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Hylidae	
Genus	*Pseudacris*	
Species	*regilla*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Embryo: Stage 12 Tadpole: 12 days post-hatch	
Source of organisms	Eggs collected locally, Corvallis Oregon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	Embryo: 10-d Tadpole: 14-d	
Data for multiple times?	No	
Effect 1	% Mortality Embryo	
Control response 1	1) 6.7% 2) 0%	
Effect 2	% Mortality Tadpole	
Control response 2	1) 4.2% 2) 12.5%	
Effect 3	Growth Inhibition – Length	
Control response 3	Not Reported	
Effect 4	Growth Inhibition – Wet Weight	
Control response 4	Not Reported	
Effect 5	Growth Inhibition – Dry Weight	
Control response 5	Not Reported	
Effect 6	Increased Deformity	
Control response 6	Embryo: 1) 6.7%, 2) 0%	

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***P. regilla***
Parameter	**Value**	**Comment**
Temperature	20 ± 1°C	
Test type	Static renewal	
Photoperiod/light intensity	16:8 light: dark	
Dilution water	Well water near Willamette River, Corvallis OR	
pH	7.4	
Hardness	72.4 ± 3.9 mg/L CaCO3	
Alkalinity	63.5 ± 5.7 mg/L	
Conductivity	194.6 ± 7.2µS/cm	
Dissolved Oxygen	7.0 ± 0.1 mg/L	
Feeding	No	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	108.3% ± 3.1%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Not Reported	
Concentration 1 Meas	29.1 ± 0.5 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 2 Meas	21.1 ± 0.6 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 3 Meas	14.5 ± 0.4 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 4 Meas	7.6 ± 0.1 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 5 Meas	3.8 ± 0.1 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 6 Meas	1.0 ± 0.04 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 7 Meas	1.0 ± 0.2 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Concentration 8 Meas	0.5 ± 0.2 mg/L	3 rep 10 embryos/rep, 8 tadpoles/rep
Control	0	3 rep 10 embryos/rep, 8 tadpoles/rep
LC50; indicate calculation method	10-d Embryo: Acute toxicity insufficient (>29.1 mg/L)	Method: trimmed Spearman-Karber

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***P. regilla***
Parameter	**Value**	**Comment**
	14-d Tadpole (95% CI): 1) 19.6 (13.9-27.7) mg/L 2) 10.8 (8.1 – 14.6) mg/L	
EC50; indicate calculation method	10-d Embryo for Deformity: 22.2 (95% CI 20.5-24.2)	Method: trimmed Spearman-Karber
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	10-d Embryo: 1a) >29.1 mg/L - Length 1b) 14.5 mg/L - Deformity 14-d Tadpole: 1a) 21.0 mg/L – Wet Weight, Dry Weight 1b) 14.5 mg/L – Length 2a) >29.1 mg/L – Length, Wet Weight 2b) 21.1 mg/L – Dry Weight	Method: Dunnett's multiple comparison procedure p: MSD:
LOAEL; indicate calculation method	10-d Embryo: 1a) >29.1 mg/L – Length 1b) 29.1 mg/L – Deformity 14-d Tadpole: 1a) 29.1 mg/L – Wet Weight, Dry Weight 1b) 21.1 mg/L – Length 2a) >29.1 mg/L – Length, Wet Weight 2b) 29.1 mg/L – Dry Weight	Method: Dunnett's multiple comparison procedure
MATC (GeoMean NOEC,LOEC)	14-d Tadpole: Length: 17.49 mg/L Dry Weight: 24.75 mg/L Wet Weight: 24.72 mg/L Deformity: 20.54 mg/L	

Reliability Point Losses Table 3.7: -3 Photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -2 inappropriate duration, -1 random assignment NR, -2 photoperiod NR, -2 random design NR, -3 hypothesis tests

Toxicity Data Summary

*Pseudokirchneriella subcapitata (*formerly *Selenastrum capricornutum)*

Study: Blasberg, J, Hicks, SL, Bucksath, J. 1991. Acute Toxicity of Diuron to *Selenastrum capricornutum* Printz. EPA MRID 422184-01. DuPont Agricultural Products Experimental Station. Wilmington, DE. (via ABC Laboratories, Inc. Columbia, MS)

Relevance
Score: 100
Rating: R

Reliability
Score: 87.5
Rating: R

Reference	**Blasberg *et al.* 1991**	***P. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Chlorophyta	Green algae
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Ankistrodesmaceae	
Genus	*Pseudokirchneriella*	formerly *Selenastrum*
Species	*subcapitata*	*capricornutum* Printz
Family in North America?	Yes	
Age/size at start of test/growth phase	2d old	
Source of organisms	lab culture	Dept. of Botany, University of Texas at Austin
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	120h	
Data for multiple times?	Yes	
Effect 1	Growth inhibition	Via algal cell counts
Control response 1	Logarithmic growth	
Temperature (°C)	24	
Test type	Static (constant rotary agitation, 100rpm)	
Photoperiod/light intensity	Continuous/4600 lux	
Dilution water	Synthetic algae culture medium	Nutrient solutions diluted in RO water
pH	7.5 at t_0	8.3-9.1 at 120 h
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Dissolved nutrients in solution	Nutrients documented in study

Appendix, Section 1: Studies rated RR

Reference	**Blasberg *et al.* 1991**	***P. subcapitata***
Parameter	**Value**	**Comment**
Purity of test substance	96.8%	
Concentrations measured?	Yes	At 0 and 120 h
Measured is what % of nominal?	91-104% at t_0	68-88% at 120 h (due to algal uptake)
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0.01% acetone or less	
Concentration 1 Nom*/Meas at t_0/ Meas at 120 h (µg/L)	0.33/0.30/0.24	3 reps with ~4500 cells/mL for each flask
Concentration 2 Nom*/Meas at t_0/ Meas at 120 h (µg/L)	0.65/0.61/0.44	3 reps with ~4500 cells/mL for each flask
Concentration 3 Nom*/Meas at t_0/ Meas at 120 h (µg/L)	1.3/1.3/0.99	3 reps with ~4500 cells/mL for each flask
Concentration 4 Nom*/Meas at t_0/ Meas at 120 h (µg/L)	2.5/2.5/2.0	3 reps with ~4500 cells/mL for each flask
Concentration 5 Nom*/Meas at t_0/ Meas at 120 h (µg/L)	5.0/5.2/4.4	3 reps with ~4500 cells/mL for each flask
Control	Dilution water control, Solvent control (acetone)	3 reps with ~4500 cells/mL for each flask
EC50 (120h); indicate calculation method	2.9 µg/L 95% CI: 2.5-3.5 µg/L	*discrepancy with reporting in body and Table V of numbers
NOEL; calculation method, p-value and minimum significant difference (MSD)	1.3 µg/L	Method: Dunnett's Test p: 0.05 MSD: NR

Other notes:
-Logarithmic phase growth was confirmed at 120-h with a mean count of 1.3 x 10^6 cells/mL (a 290-fold increase from the initial).
-Growth data were subjected to a one-way ANOVA and multiple means test (Dunnett's test). Dunnett's test indicated a significant inhibition effect ($p \leq 0.05$) on growth for the 2.5 and 5.0 ug/L test concentrations compared to the vehicle blank.
-Other data reported
EC50 (72h) = 2.3 µg/L, 95% CI: 1. -2.3 µg/L, NOEL (72 h): 0.44 µg/L
EC50 (96h) = 3.0 µg/L, 95% CI: 2.1-2.9 µg/L, NOEL (96 h): 0.44 µg/L

Reliability Point Losses Table 3.7: -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -2 MSD NR.
Reliability Point Losses Table 3.8: -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -2 hypothesis tests.

Toxicity Data Summary

Rana aurora

Study: Schuytema GS, Nebeker AV. 1998. Comparative toxicity of diuron on Survival and growth of Pacific treefrog, bullfrog, red-legged frog, and African clawed frog embryos and tadpoles. *Archives of Environmental Contamination and Toxicology* 34:370-376.

Relevance
Score: 100
Rating: R

Reliability
Score: 92
Rating: R

Reference	**Schuytema and Nebeker 1998**	***R. aurora***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991, 1997	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Ranidae	
Genus	*Rana*	
Species	*aurora*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Tadpole: 7-day post-hatch	
Source of organisms	Eggs collected locally, Corvallis Oregon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	Tadpole: 14-d	
Data for multiple times?	No	
Effect 1	% Mortality	
Control response 1	0%	
Effect 2	Growth Inhibition – Wet Weight	
Control response 2	Not Reported	
Temperature	20 ± 1°C	
Test type	Static renewal	
Photoperiod/light intensity	16:8 light: dark	
Dilution water	Well water near Willamette River, Corvallis OR	
pH	7.4	
Hardness	72.4 ± 3.9 mg/L $CaCO_3$	
Alkalinity	63.5 ± 5.7 mg/L	
Conductivity	194.6 ± 7.2µS/cm	

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***R. aurora***
Parameter	**Value**	**Comment**
Dissolved Oxygen	7.0 ± 0.1 mg/L	
Feeding	No	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	108.3 ± 3.1%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Not Reported	
Concentration 1 Meas	29.1 ± 0.5 mg/L	3 rep 8 tadpoles/rep
Concentration 2 Meas	21.1 ± 0.6 mg/L	3 rep 8 tadpoles/rep
Concentration 3 Meas	14.5 ± 0.4 mg/L	3 rep 8 tadpoles/rep
Concentration 4 Meas	7.6 ± 0.1 mg/L	3 rep 8 tadpoles/rep
Concentration 5 Meas	3.8 ± 0.1 mg/L	3 rep 8 tadpoles/rep
Concentration 6 Meas	1.0 ± 0.04 mg/L	3 rep 8 tadpoles/rep
Concentration 7 Meas	1.0 ± 0.2 mg/L	3 rep 8 tadpoles/rep
Concentration 8 Meas	0.5 ± 0.2 mg/L	3 rep 8 tadpoles/rep
Control	0	3 rep 8 tadpoles/rep
LC50 (95% CI); indicate calculation method	14-d Tadpole: 22.2 mg/L (19.8-25.0)	Method: trimmed Spearman-Karber
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	7.6 mg/L – Wet Weight	Method: Dunnett's multiple comparison procedure p: NR MSD: NR
LOAEL; indicate calculation method	14.5 mg/L – Wet Weight	Method: Dunnett's multiple comparison procedure
MATC (GeoMean NOEC,LOEC)	10.5 mg/L – Wet Weight	

Reliability Point Losses Table 3.7: -3 Photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -2 inappropriate duration, -1 random assignment NR, -2 photoperiod NR, -2 random design NR, -3 hypothesis tests

Toxicity Data Summary

Rana catesbeiana

Study: Schuytema GS, Nebeker AV. 1998. Comparative toxicity of diuron on Survival and growth of Pacific treefrog, bullfrog, red-legged frog, and African clawed frog embryos and tadpoles. *Archives of Environmental Contamination and Toxicology* 34:370-376.

Relevance
Score: 100
Rating: R

Reliability
Score: 92
Rating: R

Reference	**Schuytema and Nebeker 1998**	***R. catesbeiana***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991 (embryo), 1997 (tadpole)	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Ranidae	
Genus	*Rana*	
Species	*catesbeiana*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Tadpole: 15 month	
Source of organisms	Eggs collected locally, Corvallis Oregon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	Tadpole: 14-d	
Data for multiple times?	No	
Effect 1	% Mortality	
Control response 1	1) 0%, 2) 0%, 3) 0%	
Effect 2	Growth Inhibition – Dry Weight	
Control response 2	Not Reported	
Effect 3	Growth Inhibition – Wet Weight	
Control response 3	Not Reported	
Effect 4	Growth Inhibition – Length	
Control response 4	Not Reported	
Temperature	24 ± 1°C	
Test type	Static renewal	
Photoperiod/light intensity	16:8 light: dark	
Dilution water	Well water near Willamette	

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***R. catesbeiana***
Parameter	**Value**	**Comment**
	River, Corvallis OR	
pH	7.4	
Hardness	72.4 ± 3.9 mg/L CaCO3	
Alkalinity	63.5 ± 5.7 mg/L	
Conductivity	194.6 ± 7.2µS/cm	
Dissolved Oxygen	7.0 ± 0.1 mg/L	
Feeding	No	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	108.3% ± 3.1%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	29.1 ± 0.5 mg/L	3 reps 5 tadpoles/rep
Concentration 2 Meas	21.1 ± 0.6 mg/L	3 reps 5 tadpoles/rep
Concentration 3 Meas	14.5 ± 0.4 mg/L	3 reps 5 tadpoles/rep
Concentration 4 Meas	7.6 ± 0.1 mg/L	3 reps 5 tadpoles/rep
Concentration 5 Meas	3.8 ± 0.1 mg/L	3 reps 5 tadpoles/rep
Concentration 6 Meas	1.0 ± 0.04 mg/L	3 reps 5 tadpoles/rep
Concentration 7 Meas	1.0 ± 0.2 mg/L	3 reps 5 tadpoles/rep
Concentration 8 Meas	0.5 ± 0.2 mg/L	3 reps 5 tadpoles/rep
Control	0	3 reps 5 tadpoles/rep
LC50 (95% CI); indicate calculation method	10-d: >29.1 mg/L 14-d: >29.1 mg/L 21-d: 12.7 (9.8 – 16.7) mg/L	Method: trimmed Spearman-Karber p: 0.05
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	10-d: 1a) 14.5 mg/L – Length, Wet Weight 1b) 7.6 mg/L – Dry Weight 14-d: 2a) 21.1 mg/L –Wet Weight 2b) 14.5 mg/L – Length, Dry Weight 21-d: 3a) >29.1 mg/L – Length, Wet	Method: Dunnett's multiple comparison procedure p: NR MSD: NR

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***R. catesbeiana***
Parameter	**Value**	**Comment**
	Weight 3b) 7.6 mg/L – Dry Weight	
LOAEL; indicate calculation method	10-d: 1a) 29.1 mg/L – Length, Wet Weight 1b) 14.5 mg/L – Dry Weight 14-d: 2a) 29.1 mg/L –Wet Weight 2b) 21.1 mg/L – Length, Dry Weight 21-d: 3a) >29.1 mg/L – Length, Wet Weight 3b) 14.5 mg/L – Dry Weight	Method: Dunnett's multiple comparison procedure
MATC (GeoMean NOEC,LOEC)	Dry Weight: 12.45 mg/L** Wet Weight: 22.56 mg/L** Length: 18.95*	SMCV calculated from * 2 values ** 3 values

Reliability Point Losses Table 3.7: -3 Photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -2 inappropriate duration, -1 random assignment NR, -2 photoperiod NR, -2 random design NR, -3 hypothesis tests

Toxicity Data Summary

Scenedesmus obliquus

Study: Geoffroy L, Teisseire H, Couderchet M, Vernet G. 2002. Effect of oxyfluorfen and diuron alone and in mixture on antioxidative enzymes of *Scenedesmus obliquus*. *Pesticide Biochemistry and Physiology*. 72:178-185.

Relevance
Score: 90*
Rating: R

Reliability
Score: 80
Rating: R

* No standard method

Reference	**Geoffroy *et al.* 2002**	***S. obliquus***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Scenedesmaceae	
Genus	*Scenedesmus*	
Species	*obliquus*	SAG 276-3a
Family in North America?	Yes	
Age/size at start of test/growth phase	10 µg/mL chlorophyll in each well	Cultures maintained in exponential growth by subculturing every week
Source of organisms	Gottingen, Germany	
Have organisms been exposed to contaminants?	No	
Organisms acclimated and disease-free?	Yes	
Organisms randomized?	No	
Test vessels randomized?	No	
Test duration	24 h	
Data for multiple times?	Yes, 48 h	
Effect 1	Decrease in chlorophyll content	Marker for growth
Control response 1	24h 19.7 ± 3	
Effect 2	Decrease in antioxidative enzyme activity	4 enzymes: CAT, GR, APX, GST
Control response 2	Displayed in Fig. 3 for 4 enzymes	
Temperature	21° C	
Test type	Static	
Photoperiod/light intensity	Continuous 90 µmol PAR $m^{-2}s^{-1}$	
Dilution water	Mineral growth medium	Couderchet & Boger 1993. (see notes)
pH	6.3	

Appendix, Section 1: Studies rated RR

Reference	**Geoffroy *et al.* 2002**	***S. obliquus***
Parameter	**Value**	**Comment**
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	0.05% (v/v) methanol	
Concentration 1 Nom (µg/L)	10	3 reps, triplicates
Concentration 2 Nom (µg/L)	20	3 reps, triplicates
Concentration 3 Nom (µg/L)	30	3 reps, triplicates
Concentration 4 Nom (µg/L)	40	3 reps, triplicates
Control	0	3 reps, triplicates
ECx; indicate calculation method	24 h EC10 = 4 µg/L 24 h EC50 = 10 µg/L 24 h EC90 = 18 µg/L	Student's t test p: < 0.05 based on growth

Other notes:

Couderchet M, Boger P. "Changes in fatty acid profile induced by herbicides," in Boger P, Sandmann G (Eds.). Target Assays for modern herbicides and related phytotoxic compounds, Lewis Publishers, Boca Raton, Ann Arbor, London, Tokyo, 1993, pp. 175-181.

Enzyme activity data presented in paper, but this is not a usable endpoint.

were not required because this was a plant toxicity test.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 measured conc NR, -8 hypothesis tests, -2 Hardness, -2 alkalinity, -2 conductivity.
Reliability Point Losses Table 3.8: -5 no std method, -4 meas conc NR, -2 random design NR, -3 hypothesis tests, -2 Hardness, -2 alkalinity, -1 conductivity.

Toxicity Data Summary

Xenopus laevis

Study: Schuytema GS, Nebeker AV. 1998. Comparative toxicity of diuron on Survival and growth of Pacific treefrog, bullfrog, red-legged frog, and African clawed frog embryos and tadpoles. *Archives of Environmental Contamination and Toxicology* 34:370-376.

Relevance
Score: 100
Rating: R

Reliability
Score: 92
Rating: R

Reference	**Schuytema and Nebeker 1998**	***X. laevis***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991, 1997, Xenopus	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Pipidae	
Genus	*Xenopus*	
Species	*laevis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Embryo: Stage 10-11 Tadpole: 11-d	
Source of organisms	Eggs collected locally, Corvallis Oregon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	Embryo: 4-d Tadpole: 14-d	
Data for multiple times?	No	
Effect 1	% Mortality Tadpole	
Control response 1	1) 13.3% 2) 6.7%	
Effect 2	% Mortality Embryo	
Control response 2	1a) 1.7%, 1b) 0% 2a) 0%, 2b) 0%	
Effect 3	Growth Inhibition - Length	
Control response 3	Not Reported	
Effect 4	Growth Inhibition – Wet Weight	
Control response 4	Not Reported	
Effect 5	Growth Inhibition – Dry Weight	
Control response 5	Not Reported	
Effect 6	Increased Deformity	
Control response 6	Embryo	

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***X. laevis***
Parameter	**Value**	**Comment**
	1a) 1.7%, 1b) 0% 2a) 0%, 2b) 0%	
Temperature	24 ± 1°C	
Test type	Static renewal	
Photoperiod/light intensity	16:8 light: dark	
Dilution water	Well water near Willamette River, Corvallis OR	
pH	7.4	
Hardness	23 ± 1.2 mg/L $CaCO_3$	
Alkalinity	25.4 ± 0.5 mg/L	
Conductivity	76.7 ± 3.7µS/cm	
Dissolved Oxygen	7.0 ± 0.1 mg/L	
Feeding	No	
Purity of test substance	99.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	108.3% ± 3.1%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas	29.1± 0.5 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 2 Meas	21.1 ± 0.6 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 3 Meas	14.5 ± 0.4 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 4 Meas	7.6 ± 0.1 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 5 Meas	3.8 ± 0.1 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 6 Meas	1.0 ± 0.04 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 7 Meas	1.0 ± 0.2 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Concentration 8 Meas	0.5 ± 0.2 mg/L	3 reps 20 embryo/rep 10 tadpoles/rep
Control	0	3 reps 20 embryo/rep 10 tadpoles/rep

Appendix, Section 1: Studies rated RR

Reference	**Schuytema and Nebeker 1998**	***X. laevis***
Parameter	**Value**	**Comment**
LC50 (95% CI) ; indicate calculation method	4-d embryo: 1) >29.1 mg/L 2) >29.1 mg/L 14-d tadpole: 1) 14.5 (11.0-18.9) 2) 8.1 (5.4-12.0)	Method: Trimmed Spearman Karber p: 0.05
NOAEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	4-d embryo: 1) 14.5 mg/L – Length, Deformity 2a) 21.1 mg/L – Deformity 2b) 7.6 mg/L – Length 14-d tadpole: 1) >29.1 mg/L – Length, Wet Weight, Dry Weight 2) >29.1 mg/L - Length, Wet Weight, Dry Weight	Method: Dunnett's multiple comparison procedure p: NR MSD: NR
LOAEL; indicate calculation method	4-d embryo: 1) 29.1 mg/L – Length, Deformity 2a) 29.1 mg/L – Deformity 2b) 14.5 mg/L – Length 14-d tadpole: 1) >29.1 mg/L – Length, Wet Weight, Dry Weight 2) >29.1 mg/L - Length, Wet Weight, Dry Weight	Method: Dunnett's multiple comparison procedure
MATC (GeoMean NOEC,LOEC)	Embryo Length: 14.68 mg/L Deformity: 22.56 mg/L	

Reliability Point Losses Table 3.7: -3 Photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -2 inappropriate duration, -1 random assignment NR, -2 photoperiod NR, -2 random design NR, -3 hypothesis tests

Appendix

Section 2
Studies rated RL, LR, LL

Toxicity Data Summary

Achnanthes brevipes

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***A. brevipes***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Achnanthales	
Family	Achnanthaceae	
Genus	*Achnanthes*	
Species	*brevipes*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***A. brevipes***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	24 (1) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, -2 hardness, -2 alkalinity. Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, -2 hardness, -2 alkalinity.

Toxicity Data Summary

Amphora exigua

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 60.5
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***A. exigua***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Thalassiophysales	
Family	Catenulaceae	
Genus	*Amphora*	
Species	*exigua*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***A. exigua***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	31 (4) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Apium nodiflorum

Study: Lambert SJ, Thomas KV, and Davy AJ. 2005. Assessment of the risk posed by the antifouling booster biocides Irgarol 1051 and diuron to freshwater macrophytes. *Chemosphere* 63:734-743.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 62
Rating: L

*Nonstandard method, no control response

Reference	**Lambert et al. 2005**	***A. nodiflorum***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Spermatophyta	
Class	Magnoliopsida	
Order	Magnoliidae	
Family	Apiaceae	
Genus	*Apium*	
Species	*nodiflorum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Single stem node w/ leaf	
Source of organisms	Collected Upper River Bure Norfolk, UK	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	14-d	
Data for multiple times?	No	
Effect 1	Relative growth rate	
Control response 1	NR	
Effect 2	Fv/Fm of Photosystem II	
Control response 2	NR	
Effect 3	Root mass production	
Control response 3	NR	
Temperature	NR, greenhouse	
Test type	Static	
Photoperiod/light intensity	NR, greenhouse	

Reference	**Lambert et al. 2005**	***A. nodiflorum***
Parameter	**Value**	**Comment**
Dilution water	Jaworski nutrient solution	Unipath Ltd. Basingstoke UK
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	>99%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	0.0025% ethanol	
Concentration 1 Nom (ng/L)	0.5	Triplicates
Concentration 2 Nom (ng/L)	50	Triplicates
Concentration 3 Nom (ng/L)	500	Triplicates
Concentration 4 Nom (ng/L)	5000	Triplicates
Control	0	Triplicates
EC50 (ng/L)	Fv/Fm: >5000 Relative growth: 2808 Root growth: 0.26	Toxcalc software, Dunnett's 1-tail t test
NOEC (ng/L)	Fv/Fm: 5000 Relative growth: 50 Root growth: < 0.5	Method: Toxcalc software

Other notes:

The root growth EC50 (0.26 ng/L) is lower than the lowest concentration tested, and therefore its use cannot be justified by current methodology.

Reliability Point Losses Table 3.7: -3 meas conc NR, -2 hardness, -2 alkalinity, -4 DO NR, -4 temperature NR, -2 conductivity NR, -3 pH NR, -3 photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 potential prior contamination, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -6 temperature NR, -1 conductivity NR, -2 pH NR, -2 photoperiod NR, -3 hypothesis tests

Toxicity Data Summary

Chara vulgaris

Study: Lambert SJ, Thomas KV, and Davy AJ. 2005. Assessment of the risk posed by the antifouling booster biocides Irgarol 1051 and diuron to freshwater macrophytes. *Chemosphere* 63:734-743.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 62
Rating: L

*Nonstandard method, no control response

Reference	**Lambert et al. 2005**	***C. vulgaris***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Streptophytina	
Class	Charophycea	
Order	Charales	
Family	Characeae	
Genus	*Chara*	
Species	*vulgaris*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Terminal lengths of shoots w/ 3 nodes	
Source of organisms	Woodbastwick Fen, Norfolk, UK	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	14-d	
Data for multiple times?	No	
Effect 1	Relative growth rate	
Control response 1	NR	
Effect 2	Fv/Fm of Photosystem II	
Control response 2	NR	
Effect 3	Root mass production	
Control response 3	NR	
Temperature	NR, greenhouse	
Test type	Static	

Reference	**Lambert et al. 2005**	***C. vulgaris***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	NR, greenhouse	
Dilution water	Jaworski nutrient solution	Unipath Ltd. Basingstoke UK
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, incorporated in media	
Purity of test substance	>99%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	0.0025% ethanol	
Concentration 1 Nom (ng/L)	0.5	Triplicates
Concentration 2 Nom (ng/L)	50	Triplicates
Concentration 3 Nom (ng/L)	500	Triplicates
Concentration 4 Nom (ng/L)	5000	Triplicates
Control	0	Triplicates
EC50 (ng/L)	Fv/Fm: 4033 Relative growth:350	Toxcalc software, Dunnett's 1-tail t test
NOEC (ng/L)	Fv/Fm: 500 Relative growth: 0.5	Method: Toxcalc software

Reliability Point Losses Table 3.7: -3 meas conc NR, -2 hardness, -2 alkalinity, -4 DO NR, -4 temperature NR, -2 conductivity NR, -3 pH NR, -3 photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 potential prior contamination, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -6 temperature NR, -1 conductivity NR, -2 pH NR, -2 photoperiod NR, -3 hypothesis tests

Toxicity Data Summary

Chlamydomonas moewusii

Study: Cain JR and Cain RK. 1983. The Effects of Selected Herbicides on Zygospore Germination and Growth of *Chlamydomonas moewusii* (Chlorophyceae, Volvocales). *Journal of Phycology* 19:301-305.

Relevance
Score: 90 (No standard method)
Rating: R

Reliability
Score: 70
Rating: L

Reference	**Cain & Cain 1983**	***C. moewusii***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlamydomonadales	
Family	Chlamydomonadaceae	
Genus	*Chlamydomonas*	
Species	*moewusii* Gerloff	UTEX strain 97
Family in North America?	Unsure	
Age/size at start of test/growth phase	Cells from stock incubated for 7d; 2.0 x 10^6 cells/plate	stock cultures 1 week old
Source of organisms	University of Texas, Austin	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	7 d	
Data for multiple times?	No	
Effect 1	Growth Inhibition	Meas. by absorbance at 565 nm
Control response 1	Not reported, but growth reported as % of controls	
Effect 2	Inhibition of zygospore germination	
Control response 2	Not reported, but germination reported as % of controls	
Temperature	21° C	+/- 1° C
Test type	Static	In media

Reference	**Cain & Cain 1983**	***C. moewusii***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	Continuous 15.3 W/m^2	Band width 430-668 nm
Dilution water	Liquid medium A (1.5% agar)	Ref. Trainor FR 1969. *J. Phycol.* 5:185-190.
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in liquid medium A	
Purity of test substance	80%	Karmex
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	0	
Concentration 1 Nom (µM; µg /L)	1.0; 233.1	2 reps w/ triplicates
Concentration 2 Nom (µM; µg/L)	2.5; 582.75	2 reps w/ triplicates
Concentration 3 Nom (µM; µg/L)	5.0; 1165.5	2 reps w/ triplicates
Concentration 4 Nom (µM; µg/L)	7.5; 1748.25	2 reps w/ triplicates
Concentration 5 Nom (µM; µg/L)	10.0; 2331	2 reps w/ triplicates
Concentration 6 Nom (µM; µg/L)	15.0; 3496.5	2 reps w/ triplicates
Concentration 7 Nom (µM; µg/L)	20.0; 4662	2 reps w/ triplicates
Concentration 8 Nom (µM; µg/L)	30.0; 6993	2 reps w/ triplicates
Concentration 9 Nom (µM; µg/L)	40.0; 9324	2 reps w/ triplicates
Concentration 10 Nom (µM; µg/L)	50.0; 11655	2 reps w/ triplicates
Concentration 11 Nom (µM; µg/L)	60.0; 13986	2 reps w/ triplicates
Concentration 12 Nom (µM; µg/L)	80.0; 18648	2 reps w/ triplicates
Control	0	2 reps w/ triplicates
EC50; indicate calculation method (95% CI)	7d EC50 = 2.4µM = 559.44 µg/L	Based on growth inhibition Method: NR $p < 0.05$

Other notes:
-When there was an absence of visible growth, the subculture technique was modified to determine if the treatment was algicidal or algistatic.
-EC50 concentrations are reported as active ingredient, not the concentration of the total formulation.
-Concentrations 1.0- 10.0 µM showed decreased growth that was significantly different from the control ($p<0.05$).

-Concentrations 15.0-80.0 μM showed absence of visible growth for diuron, 15.0-30.0 μM were algistatic and 40.0- 80.0 μM were algicidal for diuron.
-Zygospore germination was not inhibited significantly by diuron at any concentrations tested. Zygospores are known to be more resistant than vegetative cells to herbicides.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 measured conc NR, -5 statistical methods NR, -6 hypothesis test statistics NR, -2 Hardness , -2 alkalinity, -4 DO, -2 conductivity, -3 pH.
Reliability Point Losses Table 3.8: -5 no std method, -4 measured conc NR, -2 random design NR, -2 statistical method NR, -3 hypothesis test info, -2 Hardness, -2 alkalinity, -6 DO, -1 conductivity, -2 pH.

Toxicity Data Summary

Chlamydomonas sp.

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Chlamydomonas sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Chlamydomonadaceae	
Genus	*Chlamydomonas*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***Chlamydomonas sp.***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. by ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. by ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. by ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	37 (3) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Chlamydomonas sp.

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 74
Rating: R

* Unacceptable test duration, nonstandard method, no control response

Reference	**Podola & Melkonian 2005**	***Chlamydomonas sp.***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Chlamydomonadaceae	
Genus	*Chlamydomonas*	
Species	NR	
Family in North America?	Yes	Northern Canada
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection Melkonian, Botany Dept. University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	NR	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol photons m^2/s	Saturation light >700 µmol photons m^2/s

Reference	**Podola & Melkonian 2005**	***Chlamydomonas sp.***
Parameter	**Value**	**Comment**
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
EC50; indicate calculation method (95% CI)	20 min EC50= 10.8 µg/L (8.5-13.6)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD: NR
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	108.9%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Chlorella pyrenoidosa

Study: Ma J. 2002. Differential sensitivity to 30 herbicides among populations of two green algae *Scenedesmus obliquus* and *Chlorella pyrenoidosa. Bulletin of Environmental Contamination and Toxicology.* 68:275-281.

Relevance
Score: 75
Rating: L

Reliability
Score: 67
Rating: L

*Nonstandard method, Low chemical purity

Reference	**Ma 2002a**	***C. pyrenoidosa***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	*pyrenoidosa*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory culture	Chinese Academy of Sciences
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	No toxicity reported in controls	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 5000 lux/cm^2	
Dilution water	HB-4 media	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	**Ma 2002a**	***C. pyrenoidosa***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	50%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.05%	
Concentration 1 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 2 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 3 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 4 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 5 Nom (mg/L)	150	Triplicates, 4 x 10^5 cells/mL
Control	0	Triplicates, 4 x 10^5 cells/mL
EC50	1.3 µg/L	Method: Linear regression, probit analysis $p < 0.01$

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -4 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -10 low chemical purity, -4 meas conc NR, -3 # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Chlorella pyrenoidosa

Study: Maule, Wright. 1984. Herbicide effects on the population growth of some green algae and cyanobacteria. *Journal of Applied Bacteriology.* 57: 369-379.

Relevance
Score: 90
Rating: R

Reliability
Score: 66.5
Rating: L

Reference	**Maule & Wright 1984**	***C. pyrenoidosa***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	*pyrenoidosa*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells, 4 d old cultures	
Source of organisms	Laboratory culture	Culture Centre of Algae and Protozoa, Cambridge, England
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	7d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	No apparent effect on growth	Solvent control
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous 4000 lux	
Dilution water	Knops solution growth media	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	**Maule & Wright 1984**	***C. pyrenoidosa***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in growth media	
Purity of test substance	95%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.1 mL/L	
Concentration 1 Nom (µg/L)	NR	Duplicates
Concentration 2 Nom (µg/L)	NR	Duplicates
Concentration 3 Nom (µg/L)	NR	Duplicates
Concentration 4 Nom (µg/L)	NR	Duplicates
Concentration 5 Nom (µg/L)	NR	Duplicates
Concentration 6 Nom (µg/L)	NR	Duplicates
Concentration 7 Nom (µg/L)	NR	Duplicates
Concentration 8 Nom (µg/L)	NR	Duplicates
Concentration 9 Nom (µg/L)	NR	Duplicates
Concentration 10 Nom (µg/L)	NR, ~75% of solubility	Duplicates
Control	0 (solvent control)	Duplicates
EC50; indicate calculation method	7 d: 0.025 mg/L	Method: NR

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -5 statistical method NR, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc NR, -2 random design NR, -2 dilution factor, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Chlorella sp.

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Chlorella sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	*sp.*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***Chlorella sp.***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	19 (2) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Chlorella sp.

Study: Ukeles R. Growth of pure cultures of marine phytoplankton in the presence of toxicants. *Applied Microbiology.* 10:532-537

Relevance
Score: 75
Rating: L

Reliability
Score: 61
Rating: L

*Nonstandard method, saltwater

Reference	**Ukeles 1962**	***Chlorella sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells; 150,000 cells/mL	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Optical density: 0.570	
Temperature	20.5 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 500 ft-c	
Dilution water	Sterile supplemented seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Reference	**Ukeles 1962**	***Chlorella sp.***
Parameter	**Value**	**Comment**
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (mg/L)	0.00002	150000 cells/mL
Concentration 2 Nom (mg/L)	0.0004	150000 cells/mL
Concentration 3 Nom (mg/L)	0.004	150000 cells/mL
Concentration 4 Nom (mg/L)	0.04	150000 cells/mL
Concentration 5 Nom (mg/L)	0.40	150000 cells/mL
Control	0	150000 cells/mL
ECx	EC100 (algicidal): 0.40 mg/L EC100 (algistatic): 0.04 mg/L EC66: 0.004 mg/L	Method: not calculated, from raw data

Reliability Point Losses Table 3.7: -5 organism source NR, -5 organism age NR, -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -5 statistical methods NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 inadequate replication, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Chlorella vulgaris

Study: Ma J, Xu L, Wang S, Zheng R, Jin S, Huang S, Huang Y. 2002. Toxicity of 40 herbicides to the green alga *Chlorella vulgaris. Ecotoxicology and Environmental Safety.* 51: 128-132.

Relevance
Score: 75
Rating: L

Reliability
Score: 67
Rating: L

*Nonstandard method, Low chemical purity

Reference	**Ma et al. 2002b**	***C. vulgaris***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	*vulgaris*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory culture	Chinese Academy of Sciences
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	No toxicity reported in controls	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 5000 lux/cm^2	
Dilution water	HB-4 media	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	**Ma et al. 2002b**	***C. vulgaris***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	50%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.05%	
Concentration 1 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 2 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 3 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 4 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 5 Nom (mg/L)	150	Triplicates, 4 x 10^5 cells/mL
Control	0	Triplicates, 4 x 10^5 cells/mL
EC50	4.3 µg/L	Method: Linear regression, probit analysis $p < 0.01$

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -4 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -10 low chemical purity, -4 meas conc NR, -3 # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).

Toxicity Data Summary

Chlorella vulgaris

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance	Reliability
Score: 90	Score: 74
Rating: R*	Rating: R

* Cannot be used for criteria derivation due to unacceptable test duration, nonstandard method

Reference	**Podola & Melkonian 2005**	***C. vulgaris***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Trebouxiophyceae	
Order	Chlorellales	
Family	Chlorellaceae	
Genus	*Chlorella*	
Species	*Vulgaris*	SAG211-11b
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Sammlung von Algenkulturen, Albreacht von Haller Institut, Universitat Gottingen, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	Displayed in Fig. 4	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic	Saturation light

Reference	**Podola & Melkonian 2005**	***C. vulgaris***
Parameter	**Value**	**Comment**
	illumination 20 µmol photons m^2/s	>700 µmol photons m^2/s
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50=27.4 µg/L (21.1-35.5)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	122.8%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Chlorococcum sp.

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Chlorococcaceae	
Genus	*Chlorococcum*	
Species	*sp.*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	20 (4) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Chlorococcum sp.

Study: Walsh GE, Grow TE. 1971. Depression of Carbohydrate in Marine Algae by Urea Herbicides. *Weed Science.* 19: 568-570.

Relevance
Score: 75
Rating: L

Reliability
Score: 72
Rating: R

*Nonstandard method, saltwater

Reference	**Walsh & Grow 1971**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	Green algae
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Chlorococcaceae	
Genus	*Chlorococcum*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	In logarithmic phase of growth
Source of organisms	Laboratory culture	Woods Hole Oceanographic Institution
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	7 d	
Data for multiple times?	Yes	
Effect 1	Carbohydrate content reduction	
Control response 1	Table 2. (at 4 salinities)	
Effect 2	Growth inhibition	
Control response 2	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12h/ 6000 lux	
Dilution water	Artificial seawater supplemented with trace	Axenic culture

Reference	**Walsh & Grow 1971**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
	elements and vitamins	
pH	7.9-8.1	
Hardness	NR	
Alkalinity	Salinity: 5, 10, 20, 30 parts per thous.	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in medium	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.003%	Acetone
Concentration 1 Nom (µg/L)	1	Duplicate tests, 3 flasks per test
Concentration 2 Nom (µg/L)	5	Duplicate tests, 3 flasks per test
Concentration 3 Nom (µg/L)	10	Duplicate tests, 3 flasks per test
Control	0	Duplicate tests, 3 flasks per test
ECx; indicate calculation method	Carbohydrate reduction at 4 salinities 5 ppt EC49: 10 µg/L 10 ppt EC56: 10 µg/L 20 ppt EC58: 10 µg/L 30 ppt EC66: 10 µg/L Growth at 4 salinities 5 ppt EC62: 10 µg/L 10 ppt EC66: 10 µg/L 20 ppt EC59: 10 µg/L 30 ppt EC61: 10 µg/L	Method: Litchfield and Wilcoxon test p: 0.05

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc NR, -4 carrier solvent, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Crassostrea virginica

Study: Ward TJ, Boeri, RL. 1991. Acute Flow-Through Mollusk Shell Deposition Test with DPX-14740-166 (Diuron). EPA MRID 422172-01. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE. (via EnviroSystems Division of Resource Analysts, Inc. Hampton, NH)

Relevance
Score: 85
Rating: L

Reliability
Score: 91
Rating: R

*Saltwater

Reference	**Ward & Boeri 1991**	***C. virginica***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Mollusca	
Class	Bivalvia	
Order	Ostreoida	
Family	Ostreidae	
Genus	*Crassostrea*	
Species	*virginica*	Eastern oyster
Family in North America?	Yes	
Age/size at start of test/growth phase	Neonates (<24h old) from 28d old parents	25-55mm in height
Source of organisms	Commercial supplier	Resource Analysts, Inc.
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96h	
Data for multiple times?	Yes	
Effect 1	Shell deposition	Longest finger of new growth measured with caliper
Control response 1	3.7, 3.6 mm growth	
Temperature (°C)	22.4-23.7	
Test type	Flow-through	Unaerated, mean of 18 volume exchanges/day/vessel

Reference	**Ward & Boeri 1991**	***C. virginica***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16h light	18 μE/s/m^2
Dilution water	Unfiltered natural seawater	30 ppt salinity
pH	7.7-7.9	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	5.7-7.4 mg/L	
Feeding	Marine phytoplankton	Anything available in dilution water
Purity of test substance	96.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	93-106%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	<0.009%	
Concentration 1 Nom*/Meas (mg/L)	2.25/2.4	20 oysters
Concentration 2 Nom*/Meas (mg/L)	3.75/3.6	20 oysters
Concentration 3 Nom*/Meas (mg/L)	6.0/5.6	20 oysters
Concentration 4 Nom*/Meas (mg/L)	9.0/8.8	20 oysters
Concentration 5 Nom*/Meas (mg/L)	15/14	20 oysters
Control	Dilution water control, Solvent control (0.1 mL/L dimethylformamide)	20 oysters each
EC50 (96h)	4.8 mg/L 95% CI: 4.4-5.2 mg/L	Method: Probit analysis
NOEC	2.4 mg/L	Method: Probit analysis

Other notes:
-Insoluble material was observed in all non-control test vessels throughout the test.
-100% survival was observed at all concentrations. Feces production was reduced at 14 mg/L, no other sublethal effects were observed.
*Toxicity calculations were based on measured concentrations, not nominal concentrations.

Reliability Point Losses Table 3.7: -2 hardness NR, -2 alkalinity NR, -2 conductivity NR, -2 MSD NR
Reliability Point Losses Table 3.8: -2 hardness NR, -2 alkalinity NR, -3 temp variability, -1 conductivity NR, -2 hypothesis tests.

Toxicity Data Summary

Cryptomonas sp.

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 74
Rating: R

*Unacceptable test duration, nonstandard endpoint, no control response

Reference	**Podola & Melkonian 2005**	***Cryptomonas sp.***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Cryptophyta	
Class	Cryptophyceae	
Order	Cryptomonadales	
Family	Scarabaeoidea	
Genus	*Cryptomonas*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection Melkonian, Botany Dept. University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	NR	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol photons m^2/s	Saturation light >700 µmol photons m^2/s

Reference	**Podola & Melkonian 2005**	***Cryptomonas sp.***
Parameter	**Value**	**Comment**
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 6.4 µg/L (5.3-7.8)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	49.2%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Ctenopharyngodon idella

Study: Tooby TE, Lucey J, Stott B. 1980. The tolerance of grass carp, *Ctenopharyngodon idella* Val., to aquatic herbicides. *Journal of Fish Biology.* 16: 591-597.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*Nonstandard method, No control response

Reference	**Tooby et al. 1980**	***C. idella***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Ctenopharyngodon*	Grass carp
Species	*idella* Val.	
Family in North America?	Yes	
Age/size at start of test/growth phase	Avg. length 9.5 ± 1.5 cm, avg. weight 15.8 ± 8.1 g, age 1+ yr.	
Source of organisms	Commercial fish farm	Austria
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Loss of swimming equilibrium	
Control response 2	NR	
Temperature	13 ± 0.5 °C	Too cold for fish, would not eat at this temperature
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tapwater	

Reference	**Tooby et al. 1980**	***C. idella***
Parameter	**Value**	**Comment**
pH	8.1	
Hardness	270 mg/L as $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	Close to saturation	Aerated
Feeding	Yea, ad libitum, lettuce	Although fish did not apparently eat
Purity of test substance	100%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.08%	
Concentration 1 Nom/Meas (µg/L)	NR	10 per test
Concentration 2 Nom/Meas (µg/L)	NR	10 per test
Concentration 3 Nom/Meas (µg/L)	NR	10 per test
Concentration 4 Nom/Meas (µg/L)	NR	10 per test
Concentration 5 Nom/Meas (µg/L)	NR	10 per test
Control	0	10 per test
LC50 (95% confidence limit)	24 h: 47 (40-55) mg/L 48 h: 44 (37-51) mg/L 96 h: 31 (28-34) mg/L	Method: probit analysis p: 0.05

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 alkalinity NR, -2 conductivity NR, -3 photoperiod NR, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 conc 2x water solubility, -1 random assignment NR, -2 #/rep, -3 feeding in acute test, -2 alkalinity NR, -3 inappropriate temperature, -1 conductivity NR, -2 photoperiod NR, -3 # of conc, -2 random design NR, -2 # of reps, -2 hypothesis tests.

Toxicity Data Summary

Cyclotella nana

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***C. nana***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Thalassiosirales	
Family	Stephanodiscaceae	
Genus	*Cyclotella*	
Species	*Nana*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***C. nana***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	39 (7) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Cyprinodon variegatus

Study: Ward TJ, Boeri, RL. 1992. Early life stage toxicity of DPX-14740-166 (Diuron) to the Sheepshead minnow, *Cyprinodon variegatus*. EPA MRID 423129-01. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE. (via EnviroSystems Division of Resource Analysts, Inc. Hampton, NH)

Relevance	Reliability
Score: 85	Score: 91
Rating: L	Rating: R

*Saltwater

Reference	**Ward & Boeri 1992**	***C. variegatus***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Chordata	
Class	Actinopterygii	
Order	Cyprinodontiformes	
Family	Cyprinodontidae	
Genus	*Cyprinodon*	
Species	*variegates*	Sheepshead minnow
Family in North America?	Yes	
Age/size at start of test/growth phase	<24 h old	
Source of organisms	Commercial supplier	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	6d embryo exposure 32d post hatch	
Data for multiple times?	yes	
Effect 1	Embryo hatching	
Control response 1	Mean of 75% hatched	Acceptable by ASTM 1988
Effect 2	Mortality	Embryos, larvae, juveniles
Control response 2	At least 95% survival at 32-d post-hatch	
Effect 3	Length of surviving fish	Measured at end of test
Control response 3	22.0 mm(dil. Water control) /23.0mm	

Reference	**Ward & Boeri 1992**	***C. variegatus***
Parameter	**Value**	**Comment**
	(solvent control)	
Effect 4	Wet weight of surviving fish	Measured at end of test
Control response 4	181.8 mg (dil. Water control)/ 228.3 mg (solvent control)	Rsd<40%
Temperature (°C)	30	
Test type	Flow-through	Aerated, ~4.9 media exchanges/day
Photoperiod/light intensity	16h light	10 $\mu E/s/m^2$
Dilution water	Filtered natural seawater (Atlantic Ocean)	20 ppt salinity
pH	7.5	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	>75% saturation	
Feeding	Hatched fish fed at least twice a day	Fed newly hatched *Artemia salina* nauplii
Purity of test substance	96.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	92-120%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	≤ 0.05%	
Concentration 1 Nom/Meas (mg/L)	0.48/ 0.44	2 reps/40 embryos each, then reduced to 20 hatched fish/rep
Concentration 2 Nom/Meas (mg/L)	0.90/ 1.0	2 reps/40 embryos each, then reduced to 20 hatched fish/rep
Concentration 3 Nom/Meas (mg/L)	1.5/ 1.7	2 reps/40 embryos each, then reduced to 20 hatched fish/rep
Concentration 4 Nom/Meas (mg/L)	3.0/ 3.6	2 reps/40 embryos each, then reduced to 20 hatched fish/rep
Concentration 5 Nom/Meas (mg/L)	6.0/ 7.1	2 reps/40 embryos each, then reduced to 20 hatched fish/rep
Control	Dilution water control, Solvent control (dimethylformamide)	2 reps/40 embryos each, then reduced to 20 hatched fish/rep

Reference	**Ward & Boeri 1992**	***C. variegatus***
Parameter	**Value**	**Comment**
NOEL; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	1.7 mg/L	Method: Probit analysis p: 0.05
LOEL; indicate calculation method	3.6 mg/L	Method: Probit analysis p: 0.05
MATC (GeoMean NOEC,LOEC)	2.5 mg/L	Method: Probit analysis p: 0.05

Other notes:
Sublethal effects observed: loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration, change in behavior.

Results of toxicity test were interpreted by standard statistical techniques, when warranted. Shapiro-Wilk's test was used to determine that data were normally distributed. A parametric one-way ANOVA and Bonferonni's test were used to compare treatment and control means. All calculations used mean measured concentrations of diuron.

The most sensitive measures of toxicity were the mortality of sheepshead minnows from 11-32 d post hatch and sublethal effects. These effects all produced an identical MATC.

Reliability Point Losses Table 3.7: -2 hardness NR, -2 alkalinity NR, -2 conductivity NR, -3 photoperiod NR, -2 MSD NR, -8 point estimates.
Reliability Point Losses Table 3.8: -2 hardness NR, -2 alkalinity NR, -1 conductivity NR, -2 photoperiod NR, -1 MSD NR, -3 point estimates.

Toxicity Data Summary

Daphnia magna

Study: Crosby DG, Tucker RK. 1966. Toxicity of Aquatic herbicides to *Daphnia magna. Science* 154:289-291.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 72
Rating: L

*Nonstandard method, unacceptable control response

Reference	**Crosby & Tucker 1966**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	No	
Phylum	Arthropoda	
Class	Crustacea	
Order	Branchiopoda	
Family	Cladocera	
Genus	*Daphnia*	
Species	*Magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1st instar	
Source of organisms	"parthenogenic stock strain"	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	26 hours	
Data for multiple times?	No	
Effect 1	Immobility	
Control response 1	Controls unaffected	
Temperature	21.1°C +/- 0.5	
Test type	Static acute	
Photoperiod/light intensity	Continuous, 1100 lu/m^2	
Dilution water	Boiled deep well tap water	
pH	8.12	
Hardness	40 mg/L as $CaCO_3$	
Alkalinity	NR	
Conductivity	493 µmhos	
Dissolved Oxygen	NR	

Reference	**Crosby & Tucker 1966**	***D. magna***
Parameter	**Value**	**Comment**
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	50µl solution diuron into 150 ml dilution water	3 reps, 25 per rep
Concentration 2 Nom/Meas (µg/L)	NR	
Concentration 3 Nom/Meas (µg/L)	NR	
Concentration 4 Nom/Meas (µg/L)	NR	
Concentration 5 Nom/Meas (µg/L)		
Control	0	
EC50; indicate calculation method	26 h: 47 (41.6-53.1) mg/L	Method: probit analysis, Litchfield and Wilcoxon

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -4 hypothesis tests.
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 carrier solvent, -6 DO NR, -3 # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests.

Toxicity Data Summary

Dunaliella euchlora

Study: Ukeles R. Growth of pure cultures of marine phytoplankton in the presence of toxicants. *Applied Microbiology.* 10:532-537

Relevance
Score: 75
Rating: L

Reliability
Score: 61
Rating: L

*Nonstandard method, saltwater

Reference	**Ukeles 1962**	***D. euchlora***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Dunaliellaceae	
Genus	*Dunaliella*	
Species	*euchlora* Lerche	
Family in North America?	yes	
Age/size at start of test/growth phase	Algal cells; 150,000 cells/mL	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Optical density: 0.630	
Temperature	20.5 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 500 ft-c	
Dilution water	Sterile supplemented seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Reference	**Ukeles 1962**	***D. euchlora***
Parameter	**Value**	**Comment**
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (mg/L)	0.00002	150000 cells/mL
Concentration 2 Nom (mg/L)	0.0004	150000 cells/mL
Concentration 3 Nom (mg/L)	0.004	150000 cells/mL
Concentration 4 Nom (mg/L)	0.04	150000 cells/mL
Concentration 5 Nom (mg/L)	0.40	150000 cells/mL
Control	0	150000 cells/mL
ECx	EC100 (algistatic): 0.004 mg/L EC100 (algicidal): 0.40 mg/L EC56: 0.0004 mg/L	Method: not calculated, from raw data

Reliability Point Losses Table 3.7: -5 organism source NR, -5 organism age NR, -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -5 statistical methods NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 inadequate replication, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Dunaliella tertiolecta

Study: Gatidou G, Thomaidis NS. 2007. Evaluation of single and joint toxic effects of two antifouling biocides, their main metabolites and copper using phytoplankton bioassays. *Aquatic Toxicology.* 85: 184-191.

Relevance
Score: 77.5
Rating: L

Reliability
Score: 70
Rating: L

*Saltwater, no control response

Reference	**Gatidou & Thomaidis 2007**	***D. tertiolecta***
Parameter	**Value**	**Comment**
Test method cited	OECD 1981, ASTM 1993	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Dunaliellaceae	
Genus	*Dunaliella*	
Species	*tertiolecta*	
Family in North America?	yes	
Age/size at start of test/growth phase	Algal cells in exponential growth phase	
Source of organisms	Laboratory culture	Laboratory of the Marine Biology and Ecology, Department of Marine Sciences, University of the Aegean
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 3000 lux	
Dilution water	Medium f/2	

Reference	**Gatidou & Thomaidis 2007**	***D. tertiolecta***
Parameter	**Value**	**Comment**
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in medium	
Purity of test substance	≤ 99%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.05%	
Concentration 1 Nom/Meas (µg/L)	0.01	Duplicates, 30-40 x 10^3 cells/mL
Concentration 2 Nom/Meas (µg/L)	0.1	Duplicates, 30-40 x 10^3 cells/mL
Concentration 3 Nom/Meas (µg/L)	1.0	Duplicates, 30-40 x 10^3 cells/mL
Concentration 4 Nom/Meas (µg/L)	10	Duplicates, 30-40 x 10^3 cells/mL
Concentration 5 Nom/Meas (µg/L)	100	Duplicates, 30-40 x 10^3 cells/mL
Concentration 6 Nom/Meas (µg/L)	1000	Duplicates, 30-40 x 10^3 cells/mL
Control	0, solvent	Triplicate, 30-40 x 10^3 cells/mL
EC50	5.9 µg/L (dups: 4.9, 6.9 µg/L)	Method: probit analysis p: NR

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -9 no control response, -4 meas conc NR, -1 random assignment NR, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 random design NR, -3 hypothesis tests

Toxicity Data Summary

Dunaliella tertiolecta

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***D. tertiolecta***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Dunaliellaceae	
Genus	*Dunaliella*	
Species	*tertiolecta*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***D. tertiolecta***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. by ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. by ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. by ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	10 (3) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Eudorina elegans

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 74
Rating: R

*Unacceptable test duration, nonstandard endpoint, no control response

Reference	**Podola & Melkonian 2005**	***E. elegans***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Scarabaeoidea	
Genus	*Eudorina*	
Species	*elegans*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection of Algae, University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	NR	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol photons m^2/s, saturation light >700 µmol photons	

Reference	**Podola & Melkonian 2005**	***E. elegans***
Parameter	**Value**	**Comment**
	m^2/s	
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 13.2 µg/L (10.4-16.9)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	82.4%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Gammarus fasciatus

Study: Sanders HO. 1970. Toxicities of some herbicides to six species of freshwater crustaceans. *Journal of the Water Pollution Control Federation.* 42, 1544-1550.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 60
Rating: L

*Nonstandard method, No control response

Reference	**Sanders 1970**	***G. fasciatus***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Evanioidea	
Genus	*Gammarus*	
Species	*Fasciatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early instar	
Source of organisms	Small streams and ponds near the Fish-Pesticide Research Laboratory	Colombia, MO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	15.5 ± 0.5 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Untreated well water	
pH	7.4	
Hardness	272 mg/L	
Alkalinity	260 mg/L	
Conductivity	NR	

Reference	**Sanders 1970**	***G. fasciatus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.1 %	
Concentration 1 Nom/Meas (µg/L)	NR	10 per rep
Concentration 2 Nom/Meas (µg/L)	NR	10 per rep
Concentration 3 Nom/Meas (µg/L)	NR	10 per rep
Concentration 4 Nom/Meas (µg/L)	NR	10 per rep
Concentration 5 Nom/Meas (µg/L)	NR	10 per rep
Control	0	10 per rep
LC50 (95% confidence limit)	24 h: 2.5 (1.0-5.5) mg/L 48 h: 1.8 (0.80-5.2) mg/L 96 h: 0.70 (0.19-8.2) mg/L	Method: modified Litchfield and Wilcoxon p: 0.05

Reliability Point Losses Table 3.7: -8 control type NR, -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 photoperiod NR, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 water solubility NR, -4 carrier solvent, -1 random assignment NR, -6 DO NR, -1 conductivity NR, -2 photoperiod NR, -2 random design NR, -2 inadequate reps, -2 dilution factor, -3 hypothesis tests.

Toxicity Data Summary

Gammarus lacustris

Study: Sanders HO. 1969. 25. Toxicity of pesticides to the crustacean *Gammarus lacustris*. Technical papers of the Bureau of Sport Fisheries and Wildlife. US Department of the Interior, Fish and Wildlife Service Washington, D. C.

Relevance	Reliability
Score: 75	Score: 62
Rating: L	Rating: L

*Nonstandard method, No control description/response

Reference	**Sanders 1969**	***G. lacustris***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Evanioidea	
Genus	*Gammarus*	
Species	*lacustris*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2 months old	
Source of organisms	Pond near the Fish-Pesticide Research Laboratory	Denver, CO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	70 °F	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	DI water + minerals	“reconstituted water”
pH	7.1	
Hardness	NR	
Alkalinity	30 ppm	

Reference	**Sanders 1969**	***G. lacustris***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	Aerated
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.1 %	
Concentration 1 Nom/Meas (µg/L)	NR	10 per rep
Concentration 2 Nom/Meas (µg/L)	NR	10 per rep
Concentration 3 Nom/Meas (µg/L)	NR	10 per rep
Concentration 4 Nom/Meas (µg/L)	NR	10 per rep
Concentration 5 Nom/Meas (µg/L)	NR	10 per rep
Control	0	10 per rep
LC50 (95% confidence limit)	24 h: 700 (590-830) µg/L 48 h: 380 (290-500) µg/L 96 h: 160 (130-190) µg/L	Method: Litchfield and Wilcoxon p: 0.05

Reliability Point Losses Table 3.7: -8 control type NR, -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 conductivity NR, -3 photoperiod NR, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not described, -9 control response NR, -4 meas conc NR, -4 water solubility NR, -4 carrier solvent, -1 random assignment NR, -1 conductivity NR, -2 photoperiod NR, -2 random design NR, -2 inadequate reps, -2 dilution factor, -3 hypothesis tests.

Toxicity Data Summary

Isochrysis galbana

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***I. galbana***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Haptophyta	
Class	Prymnesiophyceae	
Order	Isochrysidales	
Family	Scarabaeoidea	
Genus	*Isochrysis*	
Species	*galbana*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***I. galbana***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	10 (3) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Lemna gibba G3

Study: Okamura H, Nishida T, Ono Y, Shim WJ. 2003. Phytotoxic Effects of Antifouling Compounds on Nontarget Plant Species. *Bulletin of Environmental Contamination and Toxicology.* 71: 881-886.

Relevance
Score: R
Rating: 100

Reliability
Score: 73
Rating: L

Reference	**Okamura *et al.* 2003**	***L. gibba***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991	
Phylum	Tracheophyta	
Class	Liliopsida	
Order	Alismatales	
Family	Araceae	
Genus	*Lemna*	
Species	*gibba* G3	
Family in North America?	Yes	
Age/size at start of test/growth phase	Fronds that have been cultured for > 2 months	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	7 d	
Data for multiple times?	No	
Effect 1	Number of fronds	
Control response 1	State that solvent control showed no effect	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous 5000 lux	
Dilution water	0.5 Hunter's sterile growth medium	
pH	7.5	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	**Okamura *et al.* 2003**	***L. gibba***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.5% DMSO	
Concentration 1 Nom (µg/L)	NR	Triplicates
Concentration 2 Nom (µg/L)	NR	Triplicates
Concentration 3 Nom (µg/L)	NR	Triplicates
Concentration 4 Nom (µg/L)	NR	Triplicates
Concentration 5 Nom (µg/L)	NR	Triplicates
Control	0	Triplicates
EC50 (95% Confidence interval) (µg/L)	7 d: 29 (27-31)	Method: probit analysis p: 0.05

Other notes:
Check reference: Okamura *et al.* 2000. *Marine Pollution Bulletin.* 40: 754-763.

Reliability Point Losses Table 3.7: -5 organism source NR, -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -4 meas conc NR, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests

Toxicity Data Summary

Lemna minor

Study: Eullaffroy P, Frankart C, Biagianti S. 2007. Toxic effect assessment of pollutant mixtures in *Lemna minor* by using polyphasic fluorescence kinetics. *Toxicological & Environmental Chemistry.* 89:683-696.

Relevance
Score: 75
Rating: L

Reliability
Score: 62.5
Rating: L

*Not a standard method, Nonstandard endpoints

Reference	**Eullaffroy et al. 2007**	***L. minor***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Magnoliophyta	Division
Class	Liliopsida	
Order	Arales	
Family	Lemnaceae	
Genus	*Lemna*	
Species	*minor*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mature fronds	Subcultured twice a week
Source of organisms	Ponds in Ardennes France	Disinfected and then cultured
Have organisms been exposed to contaminants?	No	
Organisms acclimated and disease-free?	Yes	
Organisms randomized?	No	
Test vessels randomized?	No	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Q_R: Rate of Q_A Reduction (photosynthesis performance measurement)	Reduction of primary electron acceptor (Q_A) of photosystem II
Control response 1	Q_R=1.15 +/- 0.1	
Effect 2	% F_V/F_M inhibition (photosynthesis performance measurement)	Fast fluorescence induction kinetics of chlorophyll
Control response 2	Fig. 3 a shows response	
Effect 3	Reduction in O_2 evolution	Photosynthesis

Reference	**Eullaffroy et al. 2007**	***L. minor***
Parameter	**Value**	**Comment**
		byproduct
Control response 3	0%	
Effect 4	Fraction of inhibited centers (FIC) (photosynthesis performance measurement)	Chlorophyll fluorescence centers
Control response 4	0%	Fig. 3 b
Temperature	21° C	
Test type	Static	
Photoperiod/light intensity	Continuous 100 µE $m^{-2}s^{-1}$	
Dilution water	Mineral growth medium	
pH	6.5	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	98%	From Sigma
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	0.25% (v/v)	
Concentration 1 Nom (µg/L)	5	triplicates
Concentration 2 Nom (µg/L)	10	triplicates
Concentration 3 Nom (µg/L)	20	triplicates
Concentration 4 Nom (µg/L)	100	triplicates
Control	0	triplicates
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	5 µg/L (based on Q_R reduction) Cannot be determined for other endpoints	Method: Mann & Whitney test p: <0.05 MSD: NR
LOEC; indicate calculation method	10 µg/L (based on Q_R reduction, O_2 evolution reduction) 5 µg/L (based on F_v/F_M inhibition, FIC)	Method: Mann & Whitney test p: <0.05 MSD: NR
MATC (GeoMean NOEC,LOEC)	7.07 µg/L (based on Q_R reduction)	Geomean of NOEC & LOEC

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Minimum significant difference (2), % control of NOEC/LOEC (2), Point estimates (8).

Acceptability: No standard method (5), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Number of concentrations (3), Random design (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Lemna minor 1769

Study: Okamura H, Nishida T, Ono Y, Shim WJ. 2003. Phytotoxic Effects of Antifouling Compounds on Nontarget Plant Species. *Bulletin of Environmental Contamination and Toxicology.* 71: 881-886.

Relevance
Score: R
Rating: 100

Reliability
Score: 73
Rating: L

Reference	**Okamura *et al.* 2003**	***L. minor***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1991	
Phylum	Tracheophyta	
Class	Liliopsida	
Order	Alismatales	
Family	Araceae	
Genus	*Lemna*	
Species	*minor* 1769	
Family in North America?	Yes	
Age/size at start of test/growth phase	Fronds that have been cultured for > 2 months	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	7 d	
Data for multiple times?	No	
Effect 1	Number of fronds	
Control response 1	State that solvent control showed no effect	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous 5000 lux	
Dilution water	0.5 Hunter's sterile growth medium	
pH	7.5	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	**Okamura *et al.* 2003**	***L. minor***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	Incorporated in dilution water	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.5% DMSO	
Concentration 1 Nom (µg/L)	NR	triplicates
Concentration 2 Nom (µg/L)	NR	triplicates
Concentration 3 Nom (µg/L)	NR	triplicates
Concentration 4 Nom (µg/L)	NR	triplicates
Concentration 5 Nom (µg/L)	NR	triplicates
Control	0	triplicates
EC50 (95% Confidence interval) (µg/L)	7 d: 30 (28-31)	Method: probit analysis p: 0.05

Other notes:
Check reference: Okamura *et al.* 2000. *Marine Pollution Bulletin.* 40: 754-763.

Reliability Point Losses Table 3.7: -5 organism source NR, -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -4 meas conc NR, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -2 random design NR, -2 dilution factor, -3 hypothesis tests

Toxicity Data Summary

Lemna minor

Study: Teisseire H, Couderchet M, Vernet G. 1999. Phytotoxicity of diuron alone and in combination with copper or folpet on duckweed (*Lemna minor)*. *Environmental Pollution.* 106:39-45.

Relevance
Score: 90 (No standard method)
Rating: R

Reliability
Score: 66.5
Rating: L

Reference	**Teisseire *et al.* 1999**	***L. minor***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Magnoliophyta	Division
Class	Liliopsida	
Order	Arales	
Family	Lemnaceae	
Genus	*Lemna*	
Species	*minor*	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Artificial pond at Universite de Reims Champagne-Ardenne, France	
Have organisms been exposed to contaminants?	No	
Organisms acclimated and disease-free?	Yes	
Organisms randomized?	No	
Test vessels randomized?	Yes	
Test duration	7-d	
Data for multiple times?	No	
Effect 1	Growth inhibition	Procedure in Teisseire et al. 1998 *Ecotoxicol. Env. Safety.* 41:194-200.
Control response 1	Reported as % control	
Effect 2	Total chlorophyll content	
Control response 2	21.06 µg/mg dry wt	
Temperature	25° C	
Test type	Static renewal	Renewal on day 4
Photoperiod/light intensity	Constant 2500 ± 150 lux	Equiv. to 40 µmol PAR m^{-}

Reference	**Teisseire *et al.* 1999**	***L. minor***
Parameter	**Value**	**Comment**
		$^{2}s^{-1}$
Dilution water	Mineral medium	Teisseire et al. 1998. *Ecotoxicol. Env. Safety.* 41:194-200.
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (µg/L)	5	3 reps, triplicates
Concentration 2 Nom (µg/L)	10	3 reps, triplicates
Concentration 3 Nom (µg/L)	20	3 reps, triplicates
Concentration 4 Nom (µg/L)	30	3 reps, triplicates
Concentration 5 Nom (µg/L)	40	3 reps, triplicates
Concentration 6 Nom (µg/L)	60	3 reps, triplicates
Concentration 7 Nom (µg/L)	100	3 reps, triplicates
Control	0	3 reps, triplicates
LCx; indicate calculation method	n/a	
ECx; indicate calculation method	7d EC50 = 25 ± 3 µg/L 7d EC90 = 60 ± 2 µg/L	Based on growth
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	NR	Method: NR
LOEC; indicate calculation method	5 µg/L	

Other notes:
- Concentrations given as active ingredient.
- Chlorophyll content remained higher than the control after 7d exposure at the EC90 concentration (growth), which suggests that in spite of growth inhibition the integrity of the cell is maintained.

Reliability Point Losses Table 3.7: -5 size of organism NR, -4 analytical method NR,-3 measured concentrations NR, -5 statistical methods NR, -6 hypothesis tests, -2 Hardness, -2 alkalinity, -4 DO, -2 conductivity, -3 pH.

Reliability Point Losses Table 3.8: -5 No std method, -4 measured conc NR, -3 growth phase NR, -2 random design NR, -2 statistical method NR, -2 hypothesis tests, -2 Hardness, -2 alkalinity, -6 DO, -1 conductivity, -2 pH.

Toxicity Data Summary

Lepomis macrochirus

Study: Macek KJ, Hutchinson C, Cope OB. 1969. The effects of temperature on the susceptibility of bluegills and rainbow trout to selected pesticides. *Bulletin of Environmental Contamination and Toxicology*. 4(3): 174-183.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 63
Rating: L

*Nonstandard method, No control response

Reference	**Macek et al. 1969**	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Centrarchidae	
Genus	*Lepomis*	
Species	*Macrochirus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.6-1.5 g Same weight and length ± 20%	
Source of organisms	National fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	96-h	
Data for multiple times?	Yes	
Effect 1	% Mortality at 12.7°C	
Control response 1	NR	
Effect 2	% Mortality at 18.3°C	
Control response 2	NR	
Effect 3	% Mortality at 23.8°C	
Control response 3	NR	
Temperature	12.7, 18.3, 23.8°C all ± 0.6°C	
Test type	Static	

Reference	**Macek et al. 1969**	***L. macrochirus***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	NR	
Dilution water	"reconstituted water"	
pH	7.1	
Hardness	NR	
Alkalinity	35 ppm (methyl orange)	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	No	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	Acetone
Concentration 1 Nom (µg/L)	NR	2 reps, 10 fish per rep
Concentration 2 Nom (µg/L)	NR	2 reps, 10 fish per rep
Concentration 3 Nom (µg/L)	NR	2 reps, 10 fish per rep
Concentration 4 Nom (µg/L)	NR	2 reps, 10 fish per rep
Concentration 5 Nom (µg/L)	NR	2 reps, 10 fish per rep
Control	0, solvent	2 reps, 10 fish per rep
LC50 (95% confidence limit)	24-h 12.7°C: 27 (25-29) mg/L 18.3°C: 17 (16-19) mg/L 23.8°C : 9.7 (9.1-10) mg/L 96-h 12.7°C: 8.9 (8.2-9.6) mg/L 18.3°C: 7.6 (7.0-8.2) mg/L 23.8°C : 5.9 (5.3-6.5) mg/L	Method: Modified Litchfield and Wilcoxon via probit analysis w/ linear regression p: 0.05

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -2 hardness NR, -4 DO NR, -3 photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response, -4 meas conc w/in 20% nom NR, -4 carrier solvent, -1 random assignment, -2 hardness NR, -1 conductivity NR, -2 photoperiod NR, -2 random design NR, -2 dilution factor, -3 hypothesis tests

Toxicity Data Summary

Lymnaea spp.

Study: Christian FA, Tate TM. 1983. Toxicity of fluometuron and diuron on the intermediate snail host (Lymnea spp.) of *Fasciola hepatica. Bulletin of Environ. Contam. Toxicol.* 30:628-631.

Relevance
Score: 75
Rating: N

Reliability
Score: 46
Rating: L

*Nonstandard method, low chemical purity

Reference	**Christian & Tate 1983**	***Lymnea spp.***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Mollusca	
Class	Gastropoda	
Order	Pulmonata	
Family	Lymnaeidae	
Genus	*Lymnaea*	
Species	*Spp.*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adult snails	
Source of organisms	Lab culture, 9th generation	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	96-h	
Data for multiple times?	Yes	
Effect 1	% Mortality	
Control response 1	0	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Artificial spring water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	**Christian & Tate 1983**	***Lymnea spp.***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	NR	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR – acetone	
Concentration 1 Nom (mg/L)	1	10 reps, 10 per rep
Concentration 2 Nom (mg/L)	20	10 reps, 10 per rep
Concentration 3 Nom (mg/L)	30	10 reps, 10 per rep
Concentration 4 Nom (mg/L)	40	10 reps, 10 per rep
Concentration 5 Nom (mg/L)	50	10 reps, 10 per rep
Concentration 6 Nom (mg/L)	60	10 reps, 10 per rep
Concentration 7 Nom (mg/L)	80	10 reps, 10 per rep
Concentration 8 Nom (mg/L)	100	10 reps, 10 per rep
Control	0	10 reps, 10 per rep
LC50; indicate calculation method	24-h: 33.2 mg/L 48-h: 30.3 mg/L 72-h: 28.6 mg/L 96-h: 15.3 mg/L	Method: linear regression, ANOVA $p < 0.01$

Reliability Point Losses Table 3.7: -5 age of organism NR, -5 chemical purity NR, -4 analytical method NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 temperature NR, -2 conductivity NR, -3 pH NR, -3 photoperiod NR, -5 statistical methods NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response, -10 chemical purity, -4 meas conc w/in 20% nom NR, -4 2x water solubility, -4 prior contamination, -1 random assignment, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 photoperiod NR, -2 random design NR, -2 dilution factor, -3 hypothesis tests

Toxicity Data Summary

Monochrysis lutheri

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***M. lutheri***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Heterokontophyta	
Class	Chrysophyceae	
Order	Chromulinales	
Family	Chromulinaceae	
Genus	*Monochrysis*	
Species	*Lutheri*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***M. lutheri***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	18 (3) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Monochrysis lutheri

Study: Ukeles R. Growth of pure cultures of marine phytoplankton in the presence of toxicants. *Applied Microbiology.* 10:532-537

Relevance
Score: 75
Rating: L

Reliability
Score: 61
Rating: L

*Nonstandard method, saltwater

Reference	**Ukeles 1962**	***M. lutheri***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Heterokontophyta	
Class	Chrysophyceae	
Order	Chromulinales	
Family	Chromulinaceae	
Genus	*Monochrysis*	
Species	*lutheri* Droop	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells; 150,000 cells/mL	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Optical density: 0.314	
Temperature	20.5 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 500 ft-c	
Dilution water	Sterile supplemented seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Reference	**Ukeles 1962**	***M. lutheri***
Parameter	**Value**	**Comment**
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (mg/L)	0.00002	150000 cells/mL
Concentration 2 Nom (mg/L)	0.0004	150000 cells/mL
Concentration 3 Nom (mg/L)	0.004	150000 cells/mL
Concentration 4 Nom (mg/L)	0.04	150000 cells/mL
Concentration 5 Nom (mg/L)	0.40	150000 cells/mL
Control	0	150000 cells/mL
ECx	EC100 (algicidal): 0.00002 mg/L	Method: not calculated, from raw data

Reliability Point Losses Table 3.7: -5 organism source NR, -5 organism age NR, -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -5 statistical methods NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 inadequate replication, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Myriophyllum spicatum

Study: Lambert SJ, Thomas KV, and Davy AJ. 2005. Assessment of the risk posed by the antifouling booster biocides Irgarol 1051 and diuron to freshwater macrophytes. *Chemosphere* 63:734-743.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 62
Rating: L

*Nonstandard method, no control response

Reference	**Lambert et al. 2005**	***M. spicatum***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Spermatophyta	
Class	Magnoliopsida	
Order	Haloragales	
Family	Haloragaceae	
Genus	*Myriophyllum*	
Species	*Spicatum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Terminal lengths of shoots w/ 3 nodes.	
Source of organisms	Collected Upper River Bure Norfolk, UK	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	Yes	
Test duration	14-d	
Data for multiple times?	No	
Effect 1	Relative growth rate	
Control response 1	NR	
Effect 2	Fv/Fm of Photosystem II	
Control response 2	NR	
Effect 3	Root mass production	
Control response 3	NR	
Temperature	NR, greenhouse	
Test type	Static	

Reference	**Lambert et al. 2005**	***M. spicatum***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	NR, greenhouse	
Dilution water	Jaworski nutrient solution	Unipath Ltd. Basingstoke UK
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	>99%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	0.0025% ethanol	
Concentration 1 Nom (ng/L)	0.5	Triplicates
Concentration 2 Nom (ng/L)	50	Triplicates
Concentration 3 Nom (ng/L)	500	Triplicates
Concentration 4 Nom (ng/L)	5000	Triplicates
Control	0	Triplicates
EC50	Fv/Fm: > 5000 ng/L Relative growth: 5000 ng/L	Toxcalc software, Dunnett's 1-tail t test
NOEC	Fv/Fm: 5000 ng/L Relative growth: 0.5 ng/L	Method: Toxcalc software

Reliability Point Losses Table 3.7: -3 meas conc NR, -2 hardness, -2 alkalinity, -4 DO NR, -4 temperature NR, -2 conductivity NR, -3 pH NR, -3 photoperiod NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -9 control response NR, -4 meas conc NR, -4 potential prior contamination, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -6 temperature NR, -1 conductivity NR, -2 pH NR, -2 photoperiod NR, -3 hypothesis tests

Toxicity Data Summary

Mysidopsis bahia

Study: Ward TJ, Boeri, RL. 1992. Life-cycle Toxicity of DPX-14740-166 (Diuron) to the Mysid, *Mysidopsis bahia.* EPA MRID 425006-01. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE. (via EnviroSystems Division of Resource Analysts, Inc. Hampton, NH)

Relevance
Score: 85
Rating: L

Reliability
Score: 92
Rating: R

*Saltwater

Reference	**Ward & Boeri 1992**	***M. bahia***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Arthropoda	
Class	Malacotraca	
Order	Mysida	
Family	Mysidae	
Genus	*Mysidopsis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile, <24h	
Source of organisms	In-house culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	28d	
Data for multiple times?	Yes	
Effect 1	# of young per surviving female	
Control response 1	NR	Led to higher NOEL/LOEL
Effect 2	Mortality of 1st generation mysids	Measured at 28d
Control response 2	at least 90% surviving	
Effect 3	Length of surviving 1st generation mysids	
Control response 3	NR	Led to higher NOEL/LOEL
Effect 4	Mean wet and dry weight	Measured at end of test (28d)

Reference	**Ward & Boeri 1992**	***M. bahia***
Parameter	**Value**	**Comment**
	of surviving mysids	
Control response 4	NR	Led to higher NOEL/LOEL
Effect 5	# of young produced per reproductive day	
Control response 5	9.6 young/female (dil. water control)/9.0 young/female (solvent control)	
Temperature (°C)	25.3	
Test type	Flow-through	Aerated, ~11.9 media exchanges/day
Photoperiod/light intensity	16h light	10 $\mu E/s/m^2$
Dilution water	Filtered natural seawater (Atlantic Ocean)	20 ppt salinity
pH	7.5	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	>60% saturation	
Feeding	Fed twice a day	Newly hatched *Artemia salina* nauplii
Purity of test substance	96.8%	
Concentrations measured?	Yes	
Measured is what % of nominal?	93-98%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0.01%	
Concentration 1 Nom/Meas (mg/L)	0.28/ 0.27	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs
Concentration 2 Nom/Meas (mg/L)	0.60/ 0.56	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs
Concentration 3 Nom/Meas (mg/L)	1.0/ 0.96	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs
Concentration 4 Nom/Meas (mg/L)	2.0/ 1.9	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs
Concentration 5 Nom/Meas (mg/L)	4.0/ 3.9	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs

Reference	**Ward & Boeri 1992**	***M. bahia***
Parameter	**Value**	**Comment**
Control	Dilution water control, Solvent control (dimethylformamide)	2 reps/30 mysids each, after 14d mysids rearranged to be in isolated male-female pairs
NOEL	0.96 mg/L	Method: Probit analysis p: 0.05
LOEL	1.9 mg/L	Method: Probit analysis p: 0.05
MATC (GeoMean NOEC, LOEC)	1.4 mg/L	Method: Probit analysis p: 0.05

Other notes:

Sublethal effects observed: loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration, change in behavior. No sublethal effects were observed during the test, statistical analysis was not warranted.

Results of toxicity test were interpreted by standard statistical techniques, when warranted. Shapiro-Wilk's test was used to determine if data were normally distributed, and Bartlett's test was used to determine if variances were homogeneous. If variances were homogeneous, a parametric one-way ANOVA and, if necessary, Dunnett's or Bonferonni's test were used to compare treatment and control means.

If variances were heteroscedastic a nonparametric ANOVA was used to compare control and treatment means. Dichotomous data was transformed prior to statistical analysis. Control and solvent control data were compared using a "t" test. Because no statistical differences were discovered between the control and solvent control data all subsequent analyses were performed with pooled control and solvent control data. All calculations used the mean measured concentrations of diuron.

The most sensitive measured effect was the number of young per surviving female.

Reliability Point Losses Table 3.7: -2 hardness NR, -2 alkalinity NR, -2 conductivity NR, -3 pH NR, -3 photoperiod NR, -8 point estimates
Reliability Point Losses Table 3.8: -2 hardness NR, -2 alkalinity NR, -1 conductivity NR, -3 point estimates

Toxicity Data Summary

Navicula forcipata

Study: Gatidou G, Thomaidis NS. 2007. Evaluation of single and joint toxic effects of two antifouling biocides, their main metabolites and copper using phytoplankton bioassays. *Aquatic Toxicology.* 85: 184-191.

Relevance
Score: 77.5
Rating: L

Reliability
Score: 70
Rating: L

*Saltwater, no control response

Reference	**Gatidou & Thomaidis 2007**	***N. forcipata***
Parameter	**Value**	**Comment**
Test method cited	OECD 1981, ASTM 1993	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Naviculales	
Family	Naviculaceae	
Genus	*Navicula*	
Species	*forcipata*	
Family in North America?	yes	
Age/size at start of test/growth phase	Algal cells in exponential growth phase	
Source of organisms	Laboratory culture	Laboratory of the Marine Biology and Ecology, Department of Marine Sciences, University of the Aegean
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 3000 lux	
Dilution water	Medium f/2	

Reference	**Gatidou & Thomaidis 2007**	***N. forcipata***
Parameter	**Value**	**Comment**
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in medium	
Purity of test substance	≤ 99%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.05%	
Concentration 1 Nom/Meas (µg/L)	0.01	Duplicates, 30-40 x 10^3 cells/mL
Concentration 2 Nom/Meas (µg/L)	0.1	Duplicates, 30-40 x 10^3 cells/mL
Concentration 3 Nom/Meas (µg/L)	1.0	Duplicates, 30-40 x 10^3 cells/mL
Concentration 4 Nom/Meas (µg/L)	10	Duplicates, 30-40 x 10^3 cells/mL
Concentration 5 Nom/Meas (µg/L)	100	Duplicates, 30-40 x 10^3 cells/mL
Concentration 6 Nom/Meas (µg/L)	1000	Duplicates, 30-40 x 10^3 cells/mL
Control	0, solvent	Triplicate, 30-40 x 10^3 cells/mL
EC50	27 µg/L (dups: 25, 28 µg/L)	Method: probit analysis p: NR

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -9 no control response, -4 meas conc NR, -1 random assignment NR, -2 hardness NR, -2 alkalinity NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 random design NR, -3 hypothesis tests

Toxicity Data Summary

Navicula inserta

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance	Reliability
Score: 75	Score: 68
Rating: L	Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***N. inserta***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Naviculales	
Family	Naviculaceae	
Genus	*Navicula*	
Species	*Inserta*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***N. inserta***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	93 (12) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Neochloris sp.

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Neochloris sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Chlorococcaceae	
Genus	*Neochloris*	
Species	*sp.*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***Neochloris sp.***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	19 (2) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Nitzschia closterium

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***N. closterium***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Bacillariales	
Family	Bacillariaceae	
Genus	*Nitzschia*	
Species	*closterium*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***N. closterium***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	50 (6) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Nitzschia (Ind. 684)

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Nitzschia* (Ind. 684)**
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Bacillariales	
Family	Bacillariaceae	
Genus	*Nitzschia*	
Species	Ind. 684	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***Nitzschia* (Ind. 684)**
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	169 (17) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Oncorhynchus mykiss

Study: Okamura H, Watanabe T, Aoyama I, Hasobe M. 2002. Toxicity evaluation of new antifouling compounds using suspension-cultured fish cells. *Chemosphere.* 46: 945-951.

Relevance
Score: 90
Rating: R

Reliability
Score: 73
Rating: L

Reference	**Okamura *et al.* 2002**	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	Rainbow trout
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile (< 24 h post-hatch); Suspension –cultured fish cells (line CHSE-sp)/ $2x10^4$ cells/well	
Source of organisms	Fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	No	
Test duration	7 d, 28 d; 24 h	
Data for multiple times?	Yes	
Effect 1	Mortality (juveniles)	
Control response 1	Always < 15%	
Effect 2	Growth of cells	
Control response 2	Displayed in Fig. 1	
Temperature	10 °C	
Test type	Static Renewal	Renewed every 2-3 d
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tap water	unaerated
pH	NR	
Hardness	NR	

Reference	**Okamura *et al.* 2002**	***O. mykiss***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	> 85% saturation	
Feeding	NR	
Purity of test substance	95%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom (µg/L)	1.0	2 Reps, 40 per rep
Concentration 2 Nom (µg/L)	2.0	2 Reps, 40 per rep
Concentration 3 Nom (µg/L)	4.0	2 Reps, 40 per rep
Concentration 4 Nom (µg/L)	8.0	2 Reps, 40 per rep
Concentration 5 Nom (µg/L)	16.0	2 Reps, 40 per rep
Control	0	2 Reps, 40 per rep
LC50 (95% Confidence interval) (mg/L)	Juveniles 7 d: 74 (29-3681) 14 d: 15 (11-29) 21 d: 5.9 (4.7-7.7) 28 d: 0.23 (0.0089-0.59)	Method: calculated based on mortality at nominal conc. p: 0.05 MSD: NR
EC50 (standard deviation) (mg/L)	Cells 24 h: 52 (22)	Method: linear regression based on 3 reps

Reliability Point Losses Table 3.7: -5 chemical purity, -4 analytical method, -3 meas conc, -2 hardness, -2 alkalinity, -3 pH, -8 hypothesis tests
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 duration, -4 meas conc w/in 20% nom, -1 random assignment, -3 feeding, -2 hardness, -2 alkalinity, -1 conductivity, -2 pH, -2 random design, -3 hypothesis tests

Toxicity Data Summary

Oscillatoria cf. *chalybea*

Study: Schrader KK, de Regt MQ, Tucker CS, Duke SO. 1997. A rapid bioassay for selective algicides. *Weed Technology.* 11: 767-774.

Relevance
Score: 75
Rating: L

Reliability
Score: 64.5
Rating: L

*Nonstandard method, Toxicity values not calculable

Reference	**Schrader et al. 1997**	***O.* cf. *chalybea***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Cyanobacteria	
Class	Cyanophyceae	
Order	Oscillatoriales	
Family	Oscillatoriaceae	
Genus	*Oscillatoria*	
Species	cf. *chalybea*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	Density: NR
Source of organisms	Isolated from Mississippi catfish pond	See: van der Ploeg et al. (1995)
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	6 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Displayed in Figure 1A	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 18.1-28.9 $\mu E/m^2/s$	
Dilution water	Modified BG-11 growth media	See: van der Ploeg et al. (1995)
pH	7.6-9.0	
Hardness	NR	

Reference	**Schrader et al. 1997**	***O.* cf. *chalybea***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	80%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.01 % (v/v)	Acetone
Concentration 1 Nom	0.1 μM	3 reps per test, 2 tests
Concentration 2 Nom	1.0 μM	3 reps per test, 2 tests
Concentration 3 Nom	10 μM	3 reps per test, 2 tests
Control	0, solvent	3 reps per test, 2 tests

Other notes:

van der Ploeg et al. 1995. *Water Sc. Technol.* 31: 173-180.

Reliability Point Losses Table 3.7: -5 growth phase, -4 analytical method, -3 meas conc, -8 hypothesis tests, -8 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc w/in 20% nom, -3 growth phase, -2 cell density NR, -2 random design, -3 hypothesis tests, -3 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Oscillatoria cf. *chalybea*

Study: Schrader KK, de Regt MQ, Tidwell PD, Tucker CS, Duke SO. 1998. Compounds with selective toxicity towards the off-flavor metabolite-producing cyanobacterium *Oscillatoria* cf. *chalybea. Aquaculture.* 163: 85-99.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 70
Rating: L

*Nonstandard method, no control response

Reference	**Schrader et al. 1998**	***O.* cf. *chalybea***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Cyanobacteria	
Class	Cyanophyceae	
Order	Oscillatoriales	
Family	Oscillatoriaceae	
Genus	*Oscillatoria*	
Species	cf. *chalybea*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1.75-2.65 x 10^4 filaments/mL, logarithmic growth phase	Spectrophotometer absorbance: 0.18-0.27 A
Source of organisms	Isolated from Mississippi catfish pond	See: van der Ploeg et al. (1995)
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 18-29 $\mu mol/m^2/s$	
Dilution water	Growth media	See: van der Ploeg et al. (1995)

Reference	**Schrader et al. 1998**	***O.* cf. *chalybea***
Parameter	**Value**	**Comment**
pH	7.6-9.0	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	80%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 2 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 3 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 4 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 5 Nom/Meas (μg/L)	NR	4 reps and # per
Control	0	4 reps and # per
EC50; indicate calculation method	96 h: 0.13 μM = 36.4 μg/L	Method: Probit analysis
LCIC (lowest complete inhibition conc.); Defined as algistatic: completely inhibits growth	96 h: 1 μM	Method: Probit analysis
LOEC; Defined as algisensitive: inhibits growth, but not completely	96 h: 1 μM	Method: Probit analysis

Other notes:

van der Ploeg et al. 1995. *Water Sc. Technol.* 31: 173-180.

Reliability Point Losses Table 3.7: -4 analytical method, -3 nominal conc, -3 meas conc, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc w/in 20% nom, -2 pH, -3 # of conc, -2 random design, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Phaeodactylum tricornutum

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***P. tricornutum***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Naviculales	
Family	Phaeodactylaceae	
Genus	*Phaeodactylum*	
Species	*tricornutum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***P. tricornutum***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	10 (3) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Phaeodactylum tricornutum (AKA *Nitzschia closterium)*

Study: Ukeles R. Growth of pure cultures of marine phytoplankton in the presence of toxicants. *Applied Microbiology.* 10:532-537

Relevance
Score: 75
Rating: L

Reliability
Score: 61
Rating: L

*Nonstandard method, saltwater

Reference	**Ukeles 1962**	***P. tricornutum***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Naviculales	
Family	Phaeodactylaceae	
Genus	*Phaeodactylum*	*Nitzschia*
Species	*tricornutum* Bohlin	*closterium*
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells; 250,000 cells/mL	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Optical density: 0.600	
Temperature	20.5 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 500 ft-c	
Dilution water	Sterile supplemented seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	**Ukeles 1962**	***P. tricornutum***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (mg/L)	0.00002	250000 cells/mL
Concentration 2 Nom (mg/L)	0.0004	250000 cells/mL
Concentration 3 Nom (mg/L)	0.004	250000 cells/mL
Concentration 4 Nom (mg/L)	0.04	250000 cells/mL
Concentration 5 Nom (mg/L)	0.40	250000 cells/mL
Control	0	250000 cells/mL
ECx; indicate calculation method	EC100 (algicidal): 0.004 mg/L EC21: 0.0004 mg/L	Method: not calculated, from raw data

Reliability Point Losses Table 3.7: -5 organism source NR, -5 organism age NR, -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -5 statistical methods NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 inadequate replication, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Platymonas sp.

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***Platymonas sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Prasinophyceae	
Order	-	
Family	-	
Genus	*Platymonas*	
Species	*sp.*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***Platymonas sp.***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	17 (3) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Porphyridium cruentum

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***P. cruentum***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Rhodophyta	
Class	Rhodellophyceae	
Order	Porphyridales	
Family	Porphyridiaceae	
Genus	*Porphyridium*	
Species	*Cruentum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***P. cruentum***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	24 (3) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Protococcus sp.

Study: Ukeles R. Growth of pure cultures of marine phytoplankton in the presence of toxicants. *Applied Microbiology.* 10:532-537

Relevance
Score: 75
Rating: L

Reliability
Score: 61
Rating: L

*Nonstandard method, saltwater

Reference	**Ukeles 1962**	***Protococcus sp.***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Volvocales	
Family	Chlamydomonadaceae	
Genus	*Protococcus*	
Species	NR	
Family in North America?	yes	
Age/size at start of test/growth phase	Algal cells; 150,000 cells/mL	
Source of organisms	NR	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Optical density: 0.407	
Temperature	20.5 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 500 ft-c	
Dilution water	Sterile supplemented seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Reference	**Ukeles 1962**	***Protococcus sp.***
Parameter	**Value**	**Comment**
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom (mg/L)	0.00002	150000 cells/mL
Concentration 2 Nom (mg/L)	0.0004	150000 cells/mL
Concentration 3 Nom (mg/L)	0.004	150000 cells/mL
Concentration 4 Nom (mg/L)	0.04	150000 cells/mL
Concentration 5 Nom (mg/L)	0.40	150000 cells/mL
Control	0	150000 cells/mL
ECx	EC100 (algicidal): 0.004 mg/L EC48: 0.00002 mg/L	Method: not calculated, from raw data

Reliability Point Losses Table 3.7: -5 organism source NR, -5 organism age NR, -4 analytical method NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -3 pH NR, -5 statistical methods NR, -8 hypothesis tests, Hardness (2), Alkalinity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -6 DO NR, -1 conductivity NR, -2 pH NR, -2 inadequate replication, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Pseudokirchneriella subcapitata (formerly *Selenastrum capricornutum)*

Study: Okamura H, Nishida T, Ono Y, Shim WJ. 2003. Phytotoxic Effects of Antifouling Compounds on Nontarget Plant Species. *Bulletin of Environmental Contamination and Toxicology.* 71: 881-886.

Relevance
Score: 85 (Controls)
Rating: L

Reliability
Score: 60
Rating: L

Reference	**Okamura *et al.* 2003**	***P. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	International Organization for Standardization (1987)	ISO/DIS 8692 Water quality- algal growth inhibition test
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Ankistrodesmaceae	
Genus	*Pseudokirchneriella*	formerly *Selenastrum*
Species	*subcapitata*	*capricornutum* Prints
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	NR	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous	
Dilution water	Nutrient medium	
pH	7.5	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	**Okamura *et al.* 2003**	***P. subcapitata***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR, DMSO	
Concentration 1 Nom (µg/L)	NR	3 reps, 10^4 cells/mL
Concentration 2 Nom (µg/L)	NR	3 reps, 10^4 cells/mL
Concentration 3 Nom (µg/L)	NR	3 reps, 10^4 cells/mL
Concentration 4 Nom (µg/L)	NR	3 reps, 10^4 cells/mL
Concentration 5 Nom (µg/L)	NR	3 reps, 10^4 cells/mL
Control	0	3 reps, 10^4 cells/mL
EC_{50} (95% confidence interval) (µg/L)	6.6 (5.9-7.2)	Method: Probit

Reliability Point Losses Table 3.7: -5 organism source NR, -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 hardness NR, -2 alkalinity NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests
Reliability Point Losses Table 3.8: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Dilution factor (2), Hypothesis tests (3).

Toxicity Data Summary

Pseudokirchneriella subcapitata

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 90
Rating: L

Reliability
Score: 74
Rating: R

* Cannot be used for criteria derivation due to unacceptable test duration, nonstandard method

Reference	**Podola & Melkonian 2005**	***P. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Ankistrodesmaceae	
Genus	*Pseudokirchneriella*	formerly *Selenastrum*
Species	*subcapitata*	*capricornutum*
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Sammlung von Algenkulturen, Albreacht von Haller Institut, Universitat Gottingen, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	Displayed in Fig. 2	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic	Saturation light

Reference	**Podola & Melkonian 2005**	***P. subcapitata***
Parameter	**Value**	**Comment**
	illumination 20 µmol photons m^2/s	>700 µmol photons m^2/s
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 13.8 µg/L (9.3-20.4)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	90.8%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

*Pseudokirchneriella subcapitata (*formerly *Selenastrum capricornutum)*

Study: Schrader KK, de Regt MQ, Tidwell PD, Tucker CS, Duke SO. 1997. A rapid bioassay for selective algicides. *Weed Technology.* 11: 767-774.

Relevance
Score: 75
Rating: L

Reliability
Score: 64.5
Rating: L

*Nonstandard method, Toxicity values not calculable

Reference	**Schrader et al. 1997**	***P. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Ankistrodesmaceae	
Genus	*Pseudokirchneriella*	AKA *Selenastrum*
Species	*subcapitata*	*capricornutum*
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	Density: NR
Source of organisms	Laboratory culture	US EPA Corvallis, OR
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	6 d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	Displayed in Figure 1B	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 18.1-28.9 $\mu E/m^2/s$	
Dilution water	Modified BG-11 growth media	See: van der Ploeg et al. (1995)
pH	7.6-9.0	
Hardness	NR	

Reference	**Schrader et al. 1997**	***P. subcapitata***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	80%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.01 % (v/v)	Acetone
Concentration 1 Nom	0.1 μM	3 reps per test, 2 tests
Concentration 2 Nom	1.0 μM	3 reps per test, 2 tests
Concentration 3 Nom	10 μM	3 reps per test, 2 tests
Control	0, solvent	3 reps per test, 2 tests

Other notes:

van der Ploeg et al. 1995. *Water Sc. Technol.* 31: 173-180.

Reliability Point Losses Table 3.7: -5 growth phase, -4 analytical method, -3 meas conc, -8 hypothesis tests, -8 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc w/in 20% nom, -3 growth phase, -2 cell density NR, -2 random design, -3 hypothesis tests, -3 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Pseudokirchneriella subcapitata (formerly *Selenastrum capricornutum)*

Study: Schrader KK, de Regt MQ, Tidwell PD, Tucker CS, Duke SO. 1998. Compounds with selective toxicity towards the off-flavor metabolite-producing cyanobacterium *Oscillatoria* cf. *chalybea. Aquaculture.* 163: 85-99.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 70
Rating: L

*Nonstandard method, no control response

Reference	**Schrader et al. 1998**	***P. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Ankistrodesmaceae	
Genus	*Pseudokirchneriella*	AKA *Selenastrum*
Species	*subcapitata*	*capricornutum* Prints
Family in North America?	Yes	
Age/size at start of test/growth phase	1.92-2.25 x 10^6 cells/mL, logarithmic growth phase	Spectrophotometer absorbance: 0.19-0.26 A
Source of organisms	Laboratory culture	US EPA, Corvallis, OR
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous, 18-29 $\mu mol/m^2/s$	
Dilution water	Growth media	See: van der Ploeg

Reference	**Schrader et al. 1998**	***P. subcapitata***
Parameter	**Value**	**Comment**
		et al. (1995)
pH	7.6-9.0	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	80%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	none	
Concentration 1 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 2 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 3 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 4 Nom/Meas (μg/L)	NR	4 reps and # per
Concentration 5 Nom/Meas (μg/L)	NR	4 reps and # per
Control	0	4 reps and # per
EC50; indicate calculation method	96 h: 0.1 μM = 28 μg/L	Method: Probit analysis
LCIC (lowest complete inhibition conc.); Defined as algistatic: completely inhibits growth	1 μM	Method: Probit analysis
LOEC; Defined as algisensitive: inhibits growth, but not completely	1 μM	Method: Probit analysis

Other notes:

van der Ploeg et al. 1995. *Water Sc. Technol.* 31: 173-180.

Reliability Point Losses Table 3.7: -4 analytical method, -3 nominal conc, -3 meas conc, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc w/in 20% nom, -2 pH, -3 # of conc, -2 random design, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Pteronarcys californica

Study: Sanders HO, Cope OB. 1968. The relative toxicities of several pesticides to naiads of three species of stoneflies. *Limnology and Oceanography.* 13: 112-117.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 70
Rating: L

*Nonstandard method, No control response

Reference	**Sanders & Cope 1968**	***P. californica***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Arthropoda	
Class	Insecta	
Order	Plecoptera	
Family	Pteronarcyidae	
Genus	*Pteronarcys*	
Species	*californica*	
Family in North America?	Yes	
Age/size at start of test/growth phase	30-35 mm body length	
Source of organisms	Mountain streams near the Fish-Pesticide Research Laboratory	Denver, CO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	15.5 ± 0.5 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	DI water + minerals	"reconstituted water"
pH	7.1	
Hardness	NR	
Alkalinity	35 ppm methyl orange alk.	

Reference	**Sanders & Cope 1968**	***P. californica***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	7 ppm at t_0, 5 ppm at 24 h, 3 ppm at 96 h	Aerated
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom/Meas (µg/L)	NR	10 per rep
Concentration 2 Nom/Meas (µg/L)	NR	10 per rep
Concentration 3 Nom/Meas (µg/L)	NR	10 per rep
Concentration 4 Nom/Meas (µg/L)	NR	10 per rep
Concentration 5 Nom/Meas (µg/L)	NR	10 per rep
Control	0	10 per rep
LC50 (95% confidence limit)	24 h: 3.60 (2.80-4.70) mg/L 48 h: 2.80 (2.10-3.8) mg/L 96 h: 1.20 (0.87-1.70) mg/L	Method: Litchfield and Wilcoxon p: 0.05

Reliability Point Losses Table 3.7: -4 analytical method, -3 nominal conc, -3 meas conc, -2 hardness, -2 conductivity, -3 photoperiod, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -9 control response, -4 meas conc w/in 20% nom, -4 2x water solubility, -4 carrier solvent, -2 hardness, -1 conductivity, -2 photoperiod, -2 random design, -2 replication, -2 dilution factor, -3 hypothesis tests.

Toxicity Data Summary

Raphidocelis subcapitata

Study: Ma J, Wang S, Wang P, Ma L, Chen X, and Xu R. 2006. Toxicity assessment of 40 herbicides to the green alga *Raphidocelis subcapitata. Ecotoxicology and Environmental Safety.* 63:456-462.

Relevance
Score: 77.5
Rating: L

Reliability
Score: 63.5
Rating: L

*Low chemical purity, No control response

Reference	**Ma et al. 2006**	***R. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	Chinese National EPA (1990)	USEPA cited, but no method directly cited
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Oocystaceae	
Genus	*Raphidocelis*	
Species	*subcapitata*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells, 5 x 10^4 cells/mL	
Source of organisms	Laboratory culture	Institute of Wuhan Hydrobiology, Chinese Academy of Science
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	No	
Test vessels randomized?	No	
Test duration	96-h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	NR	
Temperature	25°C	
Test type	Static	
Photoperiod/light intensity	450 Em^{-2}/s	

Reference	**Ma et al. 2006**	***R. subcapitata***
Parameter	**Value**	**Comment**
Dilution water	HB-4 growth media	Distilled water used to make media
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	HB-4 medium	
Purity of test substance	50%	Wettable powder
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	< 0.05%	
Concentration 1 Nom/Meas (µg/L)	NR	3 reps, 25 per rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 25 per rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 25 per rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 25 per rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 25 per rep
Control	0, solvent	3 reps, 25 per rep
EC50	0.7 µg/L	Method: Linear regression w/ probit analysis p: 0.0012

Other notes:
Chinese National EPA. 1990. Algal growth inhibiting test. In: *Guidelines for testing of chemicals.* The Chinese Chemical Industry Press, Beijing. 168-178.

Reliability Point Losses Table 3.7: -4 analytical method, -3 nominal conc, -3 meas conc, -2 hardness, -2 alkalinity, -4 DO, -3 pH, -2 conductivity, -8 hypothesis tests.
Reliability Point Losses Table 3.8: -10 chemical purity, -4 meas conc w/in 20% nom, -4 2x water solubility, -1 random assignment, -2 hardness, -2 alkalinity, -6 DO, -1 conductivity, -2 pH, -3 # of conc, -2 random design, -2 dilution factor, -3 hypothesis tests.

Toxicity Data Summary

Scenedesmus obliquus

Study: Eullaffroy P, Vernet G. 2003. The F684/F735 chlorophyll fluorescence ratio: a potential tool for rapid detection and determination of herbicide phytotoxicity in algae. *Water Research.* 37:1983-1990.

Relevance
Score: 75
Rating: L

Reliability
Score: 70
Rating: L

*Not a standard method, Toxicity values not usable

Reference	**Eullaffroy & Vernet 2003**	***S. obliquus***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Scenedesmus*	
Species	*obliquus*	Unicellular green algae
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells, 96 h old 4 µg/mL chlorophyll	In exponential growth phase
Source of organisms	Laboratory stock	Germany (Sammlung von Algenkulturen)
Have organisms been exposed to contaminants?	No	
Organisms acclimated and disease-free?	Yes	
Organisms randomized?	NR	
Test vessels randomized?	NR	
Test duration	1 min.	
Data for multiple times?	No	
Effect 1	Change in F684/F735 ratio (measure of chlorophyll fluorescence)	F684 & F735 peaks are fluorescence maxima, reflect photosystem II & photosystem I activities, respectively
Control response 1	Displayed in Fig. 2	

Reference	**Eullaffroy & Vernet 2003**	***S. obliquus***
Parameter	**Value**	**Comment**
Temperature	22 ± 1 ° C	
Test type	Static	
Photoperiod/light intensity	Continuous 50 µmol m^{-2} s^{-1}	Photosynthetically active radiation
Dilution water	Mineral growth medium	
pH	6.3	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	98%	From Sigma
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	0.25% (v/v)	
Concentration 1 Nom (µg/L)	5	triplicates
Concentration 2 Nom (µg/L)	10	triplicates
Concentration 3 Nom (µg/L)	50	triplicates
Concentration 4 Nom (µg/L)	500	triplicates
Concentration 5 Nom (µg/L)	1000	triplicates
Control	0	triplicates
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	Cannot be determined because lowest concentration tested caused effect	
LOEC; indicate calculation method	5 µg/L	Method: one-way ANOVA $p < 0.05$ MSD: NR
MATC – "Toxicity threshold"	1 µg/L	Method: Student's *t*-test of means $p < 0.05$ MSD: NR

Reliability Point Losses Table 3.7: -4 analytical method, -3 meas conc, -4 hypothesis tests, -8 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 duration, -4 meas conc w/in 20% nom, -1 random assignment, -2 random design, -3 hypothesis tests, -3 point estimates, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Scenedesmus obliquus

Study: Ma J. 2002. Differential sensitivity to 30 herbicides among populations of two green algae *Scenedesmus obliquus* and *Chlorella pyrenoidosa. Bulletin of Environmental Contamination and Toxicology.* 68:275-281.

Relevance
Score: 75
Rating: L

Reliability
Score: 67
Rating: L

*Nonstandard method, Low chemical purity

Reference	**Ma 2002a**	***S. obliquus***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Scenedesmus*	
Species	*obliquus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory culture	Chinese Academy of Sciences
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	No toxicity reported in controls	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous, 5000 lux/cm^2	
Dilution water	HB-4 media	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	**Ma 2002a**	***S. obliquus***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	50%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	< 0.05%	
Concentration 1 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 2 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 3 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 4 Nom/Meas (µg/L)	NR	Triplicates, 4 x 10^5 cells/mL
Concentration 5 Nom (mg/L)	150	Triplicates, 4 x 10^5 cells/mL
Control	0	Triplicates, 4 x 10^5 cells/mL
EC50	4.09 µg/L	Method: Linear regression, probit analysis $p < 0.01$

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 meas conc NR, -4 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -10 low chemical purity, -4 meas conc NR, -3 # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Scenedesmus subspicatus

Study: Schafer H, Hettler H, Gritsche U, Pitzen G, Roderer G, Wenzel A. 1994. Biotests using unicellular algae and ciliates for predicting long-term effects of toxicants. *Ecotoxicology and Environmental Safety*. 27: 64-81.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 64
Rating: L

Reference	**Schafer et al. 1994**	***S. subspicatus***
Parameter	**Value**	**Comment**
Test method cited	OECD (1984) Guideline 201	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Scenedesmus*	
Species	*subspicatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3 d old algal cells	6×10^4 cells/mL
Source of organisms	Laboratory culture	Sammlung von Algenkulturen, Gottingen, Germany
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	72 h	
Data for multiple times?	Yes	
Effect 1	Growth inhibition	Meas. by electronic particle counter
Control response 1	NR	
Effect 2	Growth inhibition	Meas. by *chl a* fluorescence as effective photosynthesis rate (EPR)
Control response 2	NR	
Temperature	20 ± 1°C	

Reference	**Schafer et al. 1994**	***S. subspicatus***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	Continuous 8000 lux	
Dilution water	Growth medium described in OECD method	
pH	7.1-7.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in media	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.1% (v/v)	
Concentration 1 Nom/Meas (µg/L)	NR	Triplicates
Concentration 2 Nom/Meas (µg/L)	NR	Triplicates
Concentration 3 Nom/Meas (µg/L)	NR	Triplicates
Concentration 4 Nom/Meas (µg/L)	NR	Triplicates
Concentration 5 Nom/Meas (µg/L)	NR	Triplicates
Control	0, solvent control	Triplicates
EC50; indicate calculation method	72 h: 36 µg/L	Method: according to OECD method
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	EC10 defined as NOEC Growth/particle counter 24 h: 7 µg/L 72 h: 10 µg/L Growth/EPR 24 h: 4 µg/L	Method: according to OECD method

Reliability Point Losses Table 3.7: -8 control type, -4 analytical method, -3 nominal conc, -3 meas conc, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2).
Reliability Point Losses Table 3.8: -6 appropriate control, -4 meas conc w/in 20% of nom, -4 2x water solubility, -4 carrier response, -2 random design, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1).

Toxicity Data Summary

Scherffelia dubia

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance	Reliability
Score: 90	Score: 74
Rating: R*	Rating: R

* Cannot be used for criteria derivation due to unacceptable test duration, nonstandard method

Reference	**Podola & Melkonian 2005**	***S. dubia***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Prasinophyta	
Class	Prasinophyceae	
Order	Chlorodendrales	
Family	Chlorodendraceae	
Genus	*Scherffelia*	
Species	*dubia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection Melkonian, Botany Dept. University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	Displayed in Fig. 4	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol	Saturation light >700 µmol photons

Reference	**Podola & Melkonian 2005**	***S. dubia***
Parameter	**Value**	**Comment**
	photons m^2/s	m^2/s
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 3.9 µg/L (2.5-6.2)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	70.8%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Staurodesmus convergens

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 74
Rating: R

*Unacceptable test duration, nonstandard method, no control response

Reference	**Podola & Melkonian 2005**	***S. convergens***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Zygnematophyceae	
Order	Zygnematales	
Family	Desmidiaceae	
Genus	*Staurodesmus*	
Species	*convergens*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection of Algae, University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	NR	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol photons m^2/s	Saturation light >700 µmol photons m^2/s
Dilution water	Bold's Basal Medium	

Reference	**Podola & Melkonian 2005**	***S. convergens***
Parameter	**Value**	**Comment**
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 4.1 µg/L (2.5-6.9)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	94%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).

Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Stauroneis amphoroides

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***S. amphoroides***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Bacillariophyta	
Class	Bacillariophyceae	
Order	Naviculales	
Family	Stauroneidaceae	
Genus	*Stauroneis*	
Species	*amphoroides*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	

Reference	**Hollister & Walsh 1973**	***S. amphoroides***
Parameter	**Value**	**Comment**
Dilution water	Artificial sea water	
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (µg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	31 (2) µg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Synechocystis sp.

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 74
Rating: R

*Unacceptable test duration, nonstandard method, no control response

Reference	**Podola & Melkonian 2005**	***Synechocystis sp.***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Cyanobacteria	
Class	Cyanophyceae	
Order	Synechococcales	
Family	Merismopediaceae	
Genus	*Synechocystis*	
Species	NR	
Family in North America?	Not sure	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Culture Collection Melkonian, Botany Dept. University of Cologne, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	NR	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic illumination 20 µmol photons m^2/s	Saturation light >700 µmol photons m^2/s

Reference	**Podola & Melkonian 2005**	***Synechocystis sp.***
Parameter	**Value**	**Comment**
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50= 7.6 µg/L (5.5-10.5)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	68%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).

Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Tetraselmis cordiformis

Study: Podola B, Melkonian M. 2005. Selective real-time herbicide monitoring by an array chip biosensor employing diverse microalgae. *Journal of Applied Phycology* 17:261-271.

Relevance	Reliability
Score: 90	Score: 74
Rating: R*	Rating: R

* Cannot be used for criteria derivation due to unacceptable test duration, nonstandard method

Reference	**Podola & Melkonian 2005**	***T. cordiformis***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chlorophyta	
Class	Prasinophyceae	
Order	Chlorodendrales	
Family	Chlorodendraceae	
Genus	*Tetraselmis*	
Species	*Cordiformis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-4 week old algal cells	Grown in batch cultures for 2-4 wk
Source of organisms	Sammlung von Algenkulturen, Albreacht von Haller Institut, Universitat Gottingen, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	20 min	
Data for multiple times?	No	
Effect 1	Inhibition of Photosynthesis	Measured by fluorescence
Control response 1	Displayed in Fig. 3	
Temperature	21.5° C	
Test type	Flow-through	
Photoperiod/light intensity	Continuous actinic	Saturation light

Reference	**Podola & Melkonian 2005**	***T. cordiformis***
Parameter	**Value**	**Comment**
	illumination 20 µmol photons m^2/s	>700 µmol photons m^2/s
Dilution water	Bold's Basal Medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in Bold's Basal Medium	
Purity of test substance	Analytical grade	From PESTANAL
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	<100 µg/L	Ethanol
Concentration 1 Nom (µg /L)	0.05	6 reps, 2 per rep
Concentration 2 Nom (µg/L)	1	6 reps, 2 per rep
Concentration 3 Nom (µg/L)	2	6 reps, 2 per rep
Concentration 4 Nom (µg/L)	5	6 reps, 2 per rep
Concentration 5 Nom (µg/L)	10	6 reps, 2 per rep
Concentration 6 Nom (µg/L)	50	6 reps, 2 per rep
Concentration 7 Nom (µg/L)	100	6 reps, 2 per rep
Control	0	6 reps, 2 per rep
ECx; indicate calculation method (95% CI)	20 min EC50=3.0 µg/L (2.3-3.8)	Model of sigmoidal dose-response relationship
NOEC; indicate calculation method, significance level (p-value) and minimum significant difference (MSD)	0.1 µg/L	Method: Student's t-test p: ≤0.05 MSD:
LOEC; indicate calculation method	0.5 µg/L	Method: Student's t-test
MATC (GeoMean NOEC,LOEC)	0.22 µg/L	
% control at NOEC	79.8%	

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -2 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -2 inappropriate duration, -4 meas conc NR, -2 random design NR, -1 MSD NR, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Toxicity Data Summary

Thalassiosira fluviatilis

Study: Hollister TA, Walsh GE. 1973. Differential Responses of Marine Phytoplankton to Herbicides: Oxygen Evolution. *Bulletin of Environmental Contamination and Toxicology.* 9: 291-295.

Relevance
Score: 75
Rating: L

Reliability
Score: 68
Rating: L

*Nonstandard method, saltwater

Reference	**Hollister & Walsh 1973**	***T. fluviatilis***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Ochrophyta	
Class	Coscinodiscophyceae	
Order	Thalassiosirales	
Family	Thalassiosiraceae	
Genus	*Thalassiosira*	
Species	*fluviatilis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells	
Source of organisms	Laboratory cultures	Woods Hole Oceanographic Institution , Scripps Institution of Oceanography or Indiana University
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	3 d	
Data for multiple times?	No	
Effect 1	Inhibition of oxygen evolution	
Control response 1	NR	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	12 h, 6000 lux	
Dilution water	Artificial sea water	

Reference	**Hollister & Walsh 1973**	***T. fluviatilis***
Parameter	**Value**	**Comment**
pH	7.9 – 8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 25%	Duplicates, 3 per rep
Concentration 2 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 50%	Duplicates, 3 per rep
Concentration 3 Nom/Meas (μg/L)	Conc. that inhibits O_2 evol. By ~ 75%	Duplicates, 3 per rep
Control	0	Duplicates, 3 per rep
EC50 (standard error)	95 (10) μg/L	Method: least squares method, probit analysis

Other notes:

"Concentrations required for inhibition of both growth and photosynthesis are the same" (Walsh 1972)

Walsh, GE. 1972. *Hyacinth Control Journal.* 10: 45-48.

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -4 DO NR, -2 conductivity NR, -8 hypothesis tests, Hardness (2), Alkalinity (2). Reliability Point Losses Table 3.8: -5 nonstandard method, -6 control not appropriate, -4 meas conc NR, -1 random assignment NR, -1 acclimation NR, -6 DO NR, -1 conductivity NR, -3 inadequate # of conc, -2 random design NR, -2 dilution factor, -3 hypothesis tests, Hardness (2), Alkalinity (2).

Toxicity Data Summary

Ulothrix fimbriata

Study: Maule, Wright. 1984. Herbicide effects on the population growth of some green algae and cyanobacteria. *Journal of Applied Bacteriology.* 57: 369-379.

Relevance
Score: 90
Rating: R

Reliability
Score: 66.5
Rating: L

Reference	**Maule & Wright 1984**	***U. fimbriata***
Parameter	**Value**	**Comment**
Test method cited	None	
Phylum	Chlorophyta	
Class	Ulvophyceae	
Order	Ulotrichales	
Family	Ulotrichaceae	
Genus	*Ulothrix*	
Species	*fimbriata*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Algal cells, 4 d old cultures	
Source of organisms	Laboratory culture	Culture Centre of Algae and Protozoa, Cambridge, England
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	7d	
Data for multiple times?	No	
Effect 1	Growth inhibition	
Control response 1	No apparent effect on growth	Solvent control
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	Continuous 4000 lux	
Dilution water	Knops solution growth media	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	**Maule & Wright 1984**	***U. fimbriata***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Incorporated in growth media	
Purity of test substance	95%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	≤ 0.1 mL/L	
Concentration 1 Nom (µg/L)	NR	Duplicates
Concentration 2 Nom (µg/L)	NR	Duplicates
Concentration 3 Nom (µg/L)	NR	Duplicates
Concentration 4 Nom (µg/L)	NR	Duplicates
Concentration 5 Nom (µg/L)	NR	Duplicates
Concentration 6 Nom (µg/L)	NR	Duplicates
Concentration 7 Nom (µg/L)	NR	Duplicates
Concentration 8 Nom (µg/L)	NR	Duplicates
Concentration 9 Nom (µg/L)	NR	Duplicates
Concentration 10 Nom (µg/L)	NR, ~75% of solubility	Duplicates
Control	0 (solvent control)	Duplicates
EC50; indicate calculation method	7 d: 0.54 mg/L	Method: NR

Reliability Point Losses Table 3.7: -4 analytical method NR, -3 nominal conc NR, -3 meas conc NR, -5 statistical method NR, -8 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3).
Reliability Point Losses Table 3.8: -5 nonstandard method, -4 meas conc NR, -2 random design NR, -2 dilution factor, -2 statistical method NR, -3 hypothesis tests, Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2).

Appendix

Section 3
Studies rated N

Toxicity Data Summary

Achnanthes brevipes
Amphora exigua
Chlamydomonas sp.
Cyclotella nana
Monochrysis lutheri
Navicula inserta
Neochloris sp.
Nitzschia closterium
Nitzschia (Ind. 684)
Phaeodactylum tricornutum
Platymonas sp.
Porphyridium cruentum
Stauroneis amphoroides
Thalassiosira fluviatilis

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 55 (Saltwater, Nonstandard endpoint, No control info)
Rating: N

Toxicity Data Summary

Acropora tenuis

Study: Watanabe T, Yuyama I, Yasumura S. 2006. Toxicological effects of biocides on symbiotic and aposymbiotic juveniles of the hermatypic coral *Acropora tenuis.* Journal of Experimental Marine Biology and Ecology, 339:177-188.

Relevance
Score: 30 (No standard method, saltwater, chemical purity NR, family not in N. America, no toxicity values)
Rating: N

Toxicity Data Summary

Acropora tenuis

Study: Watanabe T, Utsunomiya Y, Yuyama I. 2007. Long-term laboratory culture of symbiotic coral juveniles and their use in eco-toxicological study.

Relevance
Score: 37.5 (No standard method, saltwater, family not in N. America, chemical purity NR, control not described)
Rating: N

Toxicity Data Summary

Artemia salina

Study: Koutsaftis A, Aoyama I. 2007. Toxicity of four antifouling biocides and their mixtures on the brine shrimp *Artemia salina. Science of the Total Environment*. 387:166-174

Relevance
Score: 52.5 (No standard method, Saltwater, Chemical purity NR, Control response NR)
Rating: N

Toxicity Data Summary

Asellus brevicaudus

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***A. brevicaudus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda-- Crustacea	
Class	Branchiopoda—Phyllopoda	
Order	Isopoda	
Family	Asellidae	
Genus	*Asellus*	
Species	*brevicaudus*	Aquatic sow bugs
Family in North America?	Yes	
Age/size at start of test/growth phase	Mature	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24h, 96h	
Data for multiple times?	Yes	
Effect 1	Mortality	24h, 96h
Control response 1	Not reported	
Temperature	15°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	

Reference	**Mayer & Ellersieck 1986**	***A. brevicaudus***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	NR
Control	Not Reported	NR
LCx; indicate calculation method	LC50>10 mg/L for 24h LC50=15.5 mg/L for 96h	CI: 7.2-33.4 mg/L

Other notes:
Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Baetis sp.
Daphnia pulex
Ictalurus punctatus
Lepomis macrochirus
Pteronarcys californicus
Salmo gairdneri
Simocephalus serrulatus

Study: Cope OB. 1966. Contamination of the freshwater ecosystem by pesticides. Journal of Applied Ecology, 3: 33-44.

Relevance
Score: 60 (No standard method, Chemical purity NR, Controls not reported)
Rating: N

Toxicity Data Summary

Carassius auratus

Study: Fatima M, Mandiki SNM, Douxfils J, Silvestre F, Coppe P, Kestemont P. 2007. Combined effects of herbicides on biomarkers reflecting immune-endocrine interactions in goldfish immune and antioxidant effects. Aquatic Toxicology, 81:159-167.

Relevance
Score: 60 (No standard method, Endpoint not relevant, No toxicity values)
Rating: N

Toxicity Data Summary

Carassius auratus

Study: Saglio P, Trijasse S. 1998. Behavioral responses to atrazine and diuron in goldfish. Archives of Environmental Contamination and Toxicology, 35:484-491.

Relevance
Score: 52.5 (No standard method, Nonstandard endpoint, no toxicity values)
Rating: N

Toxicity Data Summary

Chlorococcum sp.

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, no control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlorococcales	
Family	Chlorococcaceae	
Genus	*Chlorococcum*	
Species	*sp.*	Alga
Family in North America?	Yes	
Age/size at start of test/growth phase	n/a	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	240h, 2h	
Data for multiple times?	Yes	
Effect 1	Reduction in oxygen production	
Control response 1	Not Reported	
Effect 2	Reduction in population growth	
Control response 2	Not Reported	
Temperature	20°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	30 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	

Reference	**Mayer 1987**	***Chlorococcum sp.***
Parameter	**Value**	**Comment**
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
ECx; indicate calculation method	EC50=20 ug/L (oxygen red.) EC50=10 ug/L (growth red.)	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Chlorococcum sp.
Dunaliella tertiolecta
Isochrysis galbana
Phaeodactylum tricornutum

Study: Walsh G. 1972. Effects of herbicides on photosynthesis and growth of marine unicellular algae. Hyacinth Control Journal, 10:45-48.

Relevance
Score: 67.5 (No standard method, saltwater, no control response)
Rating: N

Toxicity Data Summary

Crassostrea gigas (Thunberg)

Study: Gagnaire B, Gay M, Huvet A, Daniel JY, Saulnier D, Renault T. 2007. Combination of a pesticide exposure and a bacterial challenge: *In vivo* effects on immune response of Pacific oyster, *Crassostrea gigas* (Thunberg). Aquatic Toxicology, 84:92-102.

Relevance Reliability
Score: 30 (No standard method, Endpoint not appropriate, Saltwater, Chemical purity NR, No toxicity values)
Rating: N

Toxicity Data Summary

Crassostrea virginica

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, no control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***C. virginica***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Mollusca	
Class	Bivalvia	
Order	Ostreoida	
Family	Ostreidae	
Genus	*Crassostrea*	
Species	*virginica*	Eastern oyster
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	96h	
Data for multiple times?	No	
Effect 1	Reduction in shell deposition	
Control response 1	Not Reported	
Temperature	22°C	
Test type	Flow-through	
Photoperiod/light intensity	Not Reported	
Dilution water	25 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	

Reference	**Mayer 1987**	***C. virginica***
Parameter	**Value**	**Comment**
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
ECx; indicate calculation method	EC50=1800 ug/L	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Daphnia magna

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda-- Crustacea	
Class	Branchiopoda—Phyllopoda	
Order	Diplostraca--Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*pulex*	Water fleas
Family in North America?	Yes	
Age/size at start of test/growth phase	1st instar	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	Not reported	
Temperature	15°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	

Reference	**Mayer & Ellersieck 1986**	***D. magna***
Parameter	**Value**	**Comment**
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	NR
Control	Not Reported	NR
EC50; indicate calculation method	EC50=1.4 mg/L Confidence interval 1-1.9 mg/L	

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Daphnia magna

Study: Peterson SM, Stauber JL. 1996. New algal enzyme bioassay for the rapid assessment of aquatic toxicity. Bulletin of Environmental Contamination and Toxicology, 56:750-757.

Relevance
Score: 30 (No standard method, nonstandard endpoint, saltwater, chemical purity NR, no toxicity value)
Rating: N

Toxicity Data Summary

Daphnia pulex

Study: Sanders HO, Cope OB. 1966. Toxicities of several pesticides to two species of cladocerans. Trans. Am. Fisheries Soc., 95:165-169.

Relevance
Score: 75 (No standard method, no control info)
Rating: L

Reliability
Score: 56.5
Rating: N

	Sanders & Cope 1966	***D. pulex***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Diplostraca	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*pulex*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1st instar (≤ 18 h)	
Source of organisms	Lab culture after collected from a local pond	
Have organisms been exposed to contaminants?	Probably not	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Immobility	
Control response 1	NR	
Temperature	60 ± 1 °F	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	
pH	7.4-7.8	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	

	Sanders & Cope 1966	***D. pulex***
Parameter	**Value**	**Comment**
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Ethanol, % NR	
Concentration 1 Nom/Meas (µg/L)	# and levels NR	1 rep (?), 10/rep
Control	Not described	1 rep (?), 10/rep
EC_{50} (95% confidence interval) (µg/L)	1400 (1000-1900)	Method: Litchfield & Wilcoxon (1948)

Notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Hypothesis tests (8).
Acceptability: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3).

Toxicity Data Summary

Dunaliella tertiolecta

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, no control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***D. tertiolecta***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlamydomonadales	
Family	Dunaliellaceae	
Genus	*Dunaliella*	
Species	*tertiolecta*	Alga
Family in North America?	Yes	
Age/size at start of test/growth phase	n/a	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	240h, 2h	
Data for multiple times?	Yes	
Effect 1	Reduction in oxygen production	
Control response 1	Not Reported	
Effect 2	Reduction in population growth	
Control response 2	Not Reported	
Temperature	20°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	30 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	
Conductivity	Not Reported	

Reference	**Mayer 1987**	***D. tertiolecta***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
ECx; indicate calculation method	EC50=10 ug/L (oxygen red.) EC50=20 ug/L (growth red.)	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Gammarus fasciatus

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***G. fasciatus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda-- Crustacea	
Class	Branchiopoda—Phyllopoda	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	Sideswimmers
Species	*fasciatus*	Scuds
Family in North America?	Yes	
Age/size at start of test/growth phase	Mature	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24h, 96h	
Data for multiple times?	Yes	
Effect 1	Mortality	24h, 96h
Control response 1	Not reported	
Temperature	21°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	

Reference	**Mayer & Ellersieck 1986**	***G. fasciatus***
Parameter	**Value**	**Comment**
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per : NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per : NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per : NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per : NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per : NR
Control	Not Reported	Reps and # per : NR
LCx; indicate calculation method	LC50=0.7 mg/L for 24h LC50=0.16 mg/L for 96h	CI:0.59-0.83 mg/L CI:0.13-0.19 mg/L

Other notes:
Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Hormosira banksii (Turner)

Study: Myers JH, Gunthorpe L, Allinson G, Duda S. 2006. Effects of antifouling biocides to the germination and growth of the marine macroalga, *Hormosira banksii* (Turner) Desicaine. Marine Pollution Bulletin, 52:1048-1055.

Relevance
Score: 45 (No standard method, saltwater, chemical purity NR, family not in N. America)
Rating: N

Toxicity Data Summary

Ictalurus punctatus

Study: McCorkle FM, Chambers JE, Yarbrough JD. 1977. Acute toxicities of selected herbicides to fingerling Channel Catfish, *Ictalurus punctatus.* Bulletin of Environmental Contamination & Toxicology, 18:267-270.

Relevance
Score: 45 (No standard method, Chemical purity NR, no toxicity values, no control info)
Rating: N

Toxicity Data Summary

Isochrysis galbana

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, No control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***I. galbana***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Eukaryota	
Class	Haptophyceae	
Order	Isochrysidales	
Family	Isochrysidaceae	
Genus	*Isochrysis*	
Species	*Galbana*	Alga
Family in North America?	Yes	
Age/size at start of test/growth phase	n/a	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	240h, 2h	
Data for multiple times?	Yes	
Effect 1	Reduction in oxygen production	Test duration 2h
Control response 1	Not Reported	
Effect 2	Reduction in population growth	Test duration 240h
Control response 2	Not Reported	
Temperature	20degC	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	30 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	
Conductivity	Not Reported	

Reference	**Mayer 1987**	***I. galbana***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
ECx; indicate calculation method	EC50=10 ug/L	For both tests

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Lepomis macrochirus

Study: Baer, KN. 1991c. Static, Acute, 96-hour LC50 of DPZ-14740-165 (Karmex DF) to Bluegill Sunfish. EPA MRID 420460-01. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE.

This study is rated N and will not be used for the following reasons:
→ Half of the concentrations tested were > 2x the water solubility of diuron.
→ The point estimate was > 2x the water solubility of diuron (LC_{50} > 300 mg/L).

Reference	**Baer 1991c**	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	
Phylum	Chordata- Vertebrata	
Class	Osteichthys	
Order	Perciformes	
Family	Centrarchidae	
Genus	*Lepomis*	
Species	*macrochirus*	Bluegill
Family in North America?	Yes	
Age/size at start of test/growth phase	Purchased at <1 yr old, held for 135 d 3.1 cm (mean), 0.58 g (mean)	Size measured at test conclusion
Source of organisms	Lab culture	Northeastern Biologists, Inc. Rhineback, NJ
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	0 % mortality	
Temperature (°C)	21.5	
Test type	Static	Unaerated
Photoperiod/light intensity	16h light/ 387 Lux	
Dilution water	Well water from lab	Full analysis reported
pH	7.3-8.0	Meas. at 0, 24, 48, 72, 96 h for all reps
Hardness	74 mg/L as CaCO3	

Reference	**Baer 1991c**	***L. macrochirus***
Parameter	**Value**	**Comment**
Alkalinity	83 mg/L as CaCO3	
Conductivity	170 µmhos/cm	
Dissolved Oxygen	7.2-8.8 mg/L	Meas. at 0, 24, 48, 72, 96 h for all reps
Feeding	No feeding during test or 24 h prior	
Purity of test substance	80% of formulation	20% inert ingredients
Concentrations measured?	Yes	
Measured is what % of nominal?	Always <65%	Discussion in notes about low meas. conc.
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (mg/L)	23/ 15	2 Reps, 5 fish/rep
Concentration 2 Nom/Meas (mg/L)	39/ 18	2 Reps, 5 fish/rep
Concentration 3 Nom/Meas (mg/L)	65/ 20	2 Reps, 5 fish/rep
Concentration 4 Nom/Meas (mg/L)	108/ 21	2 Reps, 5 fish/rep
Concentration 5 Nom/Meas (mg/L)	180/ 21	2 Reps, 5 fish/rep
Concentration 6 Nom/Meas (mg/L)	300/ 25	2 Reps, 5 fish/rep
Control	0 mg/L	2 Reps, 5 fish/rep
LCx; indicate calculation method (mg/L)	LC50>300	

Other notes:

The following sublethal effects were noted: lethargy, erratic swimming, loss of equilibrium, all fish at surface, and gasping for air. These effects increased with time of exposure and with increasing exposure concentration.

The authors report that all test concentrations (excluding controls) were cloudy with undissolved test substance slowly settling to the bottom of the test vessels during the exposure period. Undissolved solids are present in the formulation, and the active ingredient sorbed to settled undissolved solids, particularly at concentrations near or above the approximately 40 ppm solubility.

Toxicity Data Summary

Lepomis macrochirus

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**				***L. macrochirus***
Parameter	**Value**				**Comment**
Test method cited	ASTM 1980, CMTTAO 1975				
Phylum	Chordata- Vertebrata				
Class	Osteichthys				
Order	Perciformes				
Family	Centrarchidae				
Genus	*Lepomis*				
Species	*Macrochirus*				Bluegill
Family in North America?	Yes				
Age/size at start of test/growth phase	0.9	0.8	0.8	0.8	12 different tests
	0.8	0.8	1.1	1.1	
	1.1	1.1	1.1	1.1	
Source of organisms	Not reported				
Have organisms been exposed to contaminants?	No				
Animals acclimated and disease-free?	Yes				
Animals randomized?	Not reported				
Test vessels randomized?	Not reported				
Test duration	24h, 96h				
Data for multiple times?	Yes				
Effect 1	Mortality				24h, 96h (both for all 15 tests)
Control response 1	Not reported				
Temperature (°C)	12	7	13	18	
	24	29	12	12	
	12	12	12	12	
Test type	S	S	S	S	S: static
	S	S	S	S	
	S	S	S	S	

Reference	**Mayer & Ellersieck 1986**				***L. macrochirus***
Parameter	**Value**				**Comment**
Photoperiod/light intensity	Not Reported				
Dilution water	Not Reported				
pH	7.5	7.1	7.1	7.1	
	7.1	7.1	6.5	8.0	
	8.5	9.5	8.0	8.0	
Hardness (mg/L)	44	44	44	44	
	44	44	44	44	
	44	44	170	300	
Alkalinity	Not Reported				
Conductivity	Not Reported				
Dissolved Oxygen	Not Reported				
Feeding	Not Reported				
Purity of test substance	95% technical grade				
Concentrations measured?	No				
Measured is what % of nominal?	n/a				
Chemical method documented?	n/a				
Concentration of carrier (if any) in test solutions	0.1% or less				
Concentration 1 Nom/Meas (µg/L)	Not Reported				Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported				Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported				Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported				Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported				Reps and # per: NR
Control	Not Reported				Reps and # per: NR
LC50 (24h); indicate calculation method (mg/L)	35.0 (28.6-42.8)	29.8 (27.3-32.5)	27.0 (24.8-29.4)	16.7 (14.9-18.7)	LC50 (confidence interval)
	8.4 (7.7-9.3)	3.6 (3.0-4.2)	>30.0	>30.0	
	>30.0	38.8 (33.2-45.4)	>30.0	>30.0	
LC50(96h); indicate calculation method	10.4 (7.6-	9.3 (8.1-10.7)	9.5 (8.5-10.6)	8.2 (7.4-9.1)	LC50 (confidence interval)

Reference	**Mayer & Ellersieck 1986**				***L. macrochirus***
Parameter	**Value**				**Comment**
(mg/L)	14.2)				
	6.4 (5.9-7.0)	2.8 (2.3-3.3)	8.6 (7.1-10.4)	10.0 (8.5-11.8)	
	10.4 (7.3-14.9)	7.0 (5.4-9.0)	8.3 (7.0-9.8)	8.0 (5.8-11.7)	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Lepomis macrochirus

Study: McCraren JP, Cope OB, Eller L. 1969. Some chronic effects of diuron on bluegills. Weed Science, 17:497.

Relevance
Score: 67.5 (No standard method, no toxicity values, control response NR)
Rating: N

Toxicity Data Summary

Morone saxatilis

Study: Hughes JS. Acute toxicity of thirty chemicals to striped bass (*Morone saxatilis*). Louisiana Department of Wildlife and Fisheries Commission, 318-343-2417:399-413.

Relevance
Score: 72.5 (No standard method, Control response)
Rating: L

Reliability
Score: 46.5
Rating: N

	Hughes	***M. saxatilis***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Moronidae	
Genus	*Morone*	
Species	*saxatilis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae and fingerlings (35-51 mm length)	
Source of organisms	fingerlings: South Carolina Wildlife Resources Department larvae: wild from Louisiana	
Have organisms been exposed to contaminants?	fingerlings: Probably not larvae: possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes: 24, 48, 72 h	
Effect 1	Mortality	
Control response 1	NR	
Temperature	70 °F	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	Hughes 1971
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR, not aerated during test	

	Hughes	***M. saxatilis***
Parameter	**Value**	**Comment**
Feeding	NR	
Purity of test substance	80%	Karmex formulation
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	NR	Larvae: 2 reps, 10/rep Fingerlings: 2 reps, 2/rep
Concentration 2 Nom/Meas (µg/L)	NR	Same as above
Concentration 3 Nom/Meas (µg/L)	NR	Same as above
Concentration 4 Nom/Meas (µg/L)	NR	Same as above
Concentration 5 Nom/Meas (µg/L)	NR	Same as above
Control	Dilution water	Same as above
LC_0 (mg active ingredient/L)	Larvae Fingerlings 24 h: 2.0 12.0 48 h: 0.1 6.0 72 h: 0.1 4.0 96 h: 0.1 1.0	Method: NR
LC_{50} (mg active ingredient/L)	Larvae Fingerlings 24 h: 3.0 14.0 48 h: 0.5 8.0 72 h: 0.5 6.0 96 h: 0.5 6.0	Method: NR
LC_{100} (mg active ingredient/L)	Larvae Fingerlings 24 h: 5.0 16.0 48 h: 3.0 12.0 72 h: 2.0 12.0 96 h: 1.0 12.0	Method: NR

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3).

Toxicity Data Summary

Mugil cephalus

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, no control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***M. cephalus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Chordata	
Class	Actinopterygii	
Order	Mugiliformes	
Family	Mugilidae	
Genus	*Mugil*	
Species	*cephalus*	Striped mullet
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	48h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	Not Reported	
Temperature	29°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	24 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	

Reference	**Mayer 1987**	***M. cephalus***
Parameter	**Value**	**Comment**
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
LCx; indicate calculation method	LC50=6300 ug/L	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Oncorhynchus kisutch

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***O. kisutch***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Chordata- Vertebrata	
Class	Osteichthys	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*kisutch*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1.4	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24h, 96h	
Data for multiple times?	Yes	
Effect 1	Mortality	24h, 96h
Control response 1	Not reported	
Temperature	13°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	

Reference	**Mayer & Ellersieck 1986**	***O. kisutch***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
LCx; indicate calculation method	LC50=11 mg/L for 24h LC50>2.4 mg/L for 96h	No CI reported

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Oncorhynchus mykiss

Study: Baer, KN. 1991b. Static, Acute 96-hour LC50 of DPX-14740-165 (Karmex DF) to Rainbow Trout (*Oncorhynchus mykiss)*. EPA MRID 420460-02. DuPont Haskell Laboratory for Toxicology and Industrial Medicine. Newark, DE.

This study is rated N and will not be used for the following reasons:
→ Half of the concentrations tested were > 2x the water solubility of diuron.
→ The point estimate was > 2x the water solubility of diuron (LC_{50} = 190 mg/L).

Reference	**Baer 1991b**	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	EPA GLP for FIFRA	40 CFR 160
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	56-d old trout	2.3-2.7 cm length, 0.13-0.19 g at end
Source of organisms	Lab culture – purchased as eggs and sperm	Aquatic Research Organisms, Hampton, NH
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	0 dead at all time points	
Temperature (°C)	11.6 (mean)	
Test type	Static	Unaerated
Photoperiod/light intensity	16h light	183 lux
Dilution water	Lab well water	
pH	7.3-8.1	
Hardness	74 mg/L as CaCO3	
Alkalinity	81 mg/L as CaCO3	
Conductivity	170 µmhos/cm	
Dissolved Oxygen	8.8-10 mg/L	

Reference	**Baer 1991b**	***O. mykiss***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	80% of formulation	20% inert ingredients
Concentrations measured?	Yes	
Measured is what % of nominal?	10.5-58.5%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom*/Meas (mg/L)	16.0/9.4	2 reps with 5 trout each
Concentration 2 Nom*/Meas (mg/L)	26/13	2 reps with 5 trout each
Concentration 3 Nom*/Meas (mg/L)	43/14	2 reps with 5 trout each
Concentration 4 Nom*/Meas (mg/L)	73/15	2 reps with 5 trout each
Concentration 5 Nom*/Meas (mg/L)	120/15	2 reps with 5 trout each
Concentration 6 Nom*/Meas (mg/L)	200/21	2 reps with 5 trout each
Control	Dilution water	2 reps with 5 trout each
LC50 (96 h); Probit method	LC50=190 mg/L 95% fiducial interval: 130-590 mg/L, slope: 3.0, y-int: -1.9	Based on nominal total formulation conc.

Other notes:

The authors report that all test concentrations (excluding controls) were cloudy with undissolved test substance slowly settling to the bottom of the test vessels during the exposure period. Undissolved solids are present in the formulation (inert ingredients). Measured concentrations are based on analysis of settled test solutions where the active ingredient sorbs to the settled undissolved solids present in the formulation, particularly at concentrations near or above the approximately 40 ppm solubility.

Toxicity Data Summary

Oncorhynchus mykiss (formerly *Salmo gairdneri*)

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**					***O. mykiss***
Parameter	**Value**					**Comment**
Test method cited	ASTM 1980, CMTTAO 1975					
Phylum	Chordata- Vertebrata					
Class	Osteichthys					
Order	Salmoniformes					
Family	Salmonidae					
Genus	*Oncorhynchus*					Formerly *Salmo*
Species	*mykiss*					*gairdneri*
Family in North America?	Yes					
Age/size at start of test/growth phase	0.8	1.2	1.2	1.2	1.2	11 different tests
	1.2	1.5	1.5	1.5	1.5	
	1.5					
Source of organisms	Not reported					
Have organisms been exposed to contaminants?	No					
Animals acclimated and disease-free?	Yes					
Animals randomized?	Not reported					
Test vessels randomized?	Not reported					
Test duration	24h, 96h					
Data for multiple times?	Yes					
Effect 1	Mortality					24h, 96h (both for all 15 tests)
Control response 1	Not reported					
Temperature (°C)	13	13	2	7	13	
	18	12	12	12	12	
	12					
Test type	S	S	S	S	S	S: static Deg: degradation
	S	0d deg	7d deg	14d deg	21d deg	
	28d deg					

Reference	**Mayer & Ellersieck 1986**					***O. mykiss***
Parameter	**Value**					**Comment**
Photoperiod/light intensity	Not Reported					
Dilution water	Not Reported					
pH	7.1	7.1	7.1	7.1	7.1	
	7.1	7.5	7.5	7.5	7.5	
	7.5					
Hardness (mg/L)	44	44	44	44	44	
	44	44	44	44	44	
	44					
Alkalinity	Not Reported					
Conductivity	Not Reported					
Dissolved Oxygen	Not Reported					
Feeding	Not Reported					
Purity of test substance	95% technical grade					
Concentrations measured?	No					
Measured is what % of nominal?	n/a					
Chemical method documented?	n/a					
Concentration of carrier (if any) in test solutions	0.1% or less					
Concentration 1 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Control	Not Reported					Reps and # per: NR
LC50 (24h); indicate calculation method (mg/L)	9.0 (7.6-11.0)	71.0 (61.1-82.5)	11.5 (10.5-12.7)	15.5 (14.1-17.1)	12.5 (11.5-13.6)	LC50 (confidence interval)
	8.4 (7.9-9.1)	n/a	n/a	n/a	n/a	
	n/a					
LC50(96h); indicate calculation method (mg/L)	4.9 (4.1-5.9)	16.0 (11.3-22.7)	7.7 (6.8-8.9)	7.2 (6.5-7.9)	6.2 (5.8-6.6)	LC50 (confidence interval)
	5.3	3.5	4.2	13.4	7.4	

Reference	**Mayer & Ellersieck 1986**					***O. mykiss***
Parameter	**Value**					**Comment**
	(5.1-5.7)	(2.7-4.4)	(3.1-5.6)	(10.7-16.7)	(6.2-8.7)	
	9.4 (8.3-10.7)					

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Oncorhynchus mykiss

Study: USEPA. 1975. Report of analysis for TN0897, Toxicity of Cynex liquid Diuron weed killer to Rainbow trout. Crystal Manufacturing Corporation. USEPA TN 0897.

Relevance
Score: 67.5 (No standard method, chemical purity NR, Control not described)
Rating: N

Toxicity Data Summary

Oncorhynchus mykiss (formerly *Salmo gairdneri*)

Study: USEPA. 1976. Report of analysis for TN1020, Toxicity of diuron to rainbow trout. DuPont Crop Protection. USEPA TN1020.

Relevance
Score: 82.5 (No standard method, control not described)
Rating: L

Reliability
Score: 49.5
Rating: N

	USEPA TN1020	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	Formerly *Salmo*
Species	*mykiss*	*gairdneri*
Family in North America?	Yes	
Age/size at start of test/growth phase	Average wt. 1.28 g, average length 4.84 cm	
Source of organisms	Wytheville National Fish Hatchery	
Have organisms been exposed to contaminants?	Probably not	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes; 24, 48 h	
Effect 1	Mortality	
Control response 1	0%	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	95%	

	USEPA TN1020	***O. mykiss***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Acetone, % NR	
Concentration 1 Nom (µg/L)	370	2 reps, 5/rep
Concentration 2 Nom (µg/L)	560	2 reps, 5/rep
Concentration 3 Nom (µg/L)	870	2 reps, 5/rep
Concentration 4 Nom (µg/L)	1400	2 reps, 5/rep
Concentration 5 Nom (µg/L)	2100	2 reps, 5/rep
Concentration 6 Nom (µg/L)	320	2 reps, 5/rep
Concentration 7 Nom (µg/L)	4900	2 reps, 5/rep
Concentration 8 Nom (µg/L)	7500	2 reps, 5/rep
Control	Yes, but not described	2 reps, 5/rep
LC_{50} (95% confidence interval) (mg/L)	24 h: 4.75 (3.77-5.99) 48 h: 2.55 (2.11-3.08) 96 h: 1.95 (1.50-2.54)	Method: Probit
LC_{10} (95% confidence interval) (mg/L)	96 h: 1.33 (0.96-1.84)	Method: Probit

Notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8).
Acceptability: No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Adequate replicates (2), Hypothesis tests (3).

Toxicity Data Summary

Penaeus aztecus

Study: Mayer FL. 1987. Acute Toxicity Handbook of Chemicals to Estuarine Organisms. EPA Document EPA/600/8-87/017. US EPA.

Relevance
Score: 70 (Saltwater, no control info)
Rating: L

Reliability
Score: 40.5
Rating: N

Reference	**Mayer 1987**	***P. aztecus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Penaeidae	
Genus	*Penaeus (Farfantepenaeus)*	
Species	*aztecus*	Brown shrimp
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not Reported	
Test vessels randomized?	Not Reported	
Test duration	48h	
Data for multiple times?	No	
Effect 1	Immobility or loss of equilibrium	
Control response 1	Not Reported	
Temperature	29°C	
Test type	Flow-through	
Photoperiod/light intensity	Not Reported	
Dilution water	27 ppt salinity	
pH	Not Reported	
Hardness	Not Reported	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	
Concentrations measured?	No	

Reference	**Mayer 1987**	***P. aztecus***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
ECx; indicate calculation method	EC50>1000 ug/L	

Other notes:
Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Pseudokirchneriella subcapitata (formerly *Selenastrum capricornutum*)

Study: El-Jay A, Ducruet JM, Duval JC, Pelletier JP. 1997. A high-sensitivity chlorophyll fluorescence assay for monitoring herbicide inhibition of photosystem II in the Chlorophyte *Selenastrum capricornutum*: Comparison with effect on cell growth. Arch. Hydrobiol., 140:273-286.

Relevance
Score: 60 (No standard method, Chemical purity NR, Controls)
Rating: N

Toxicity Data Summary

Pteronarcys californica

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***P. californica***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda-- Crustacea	
Class	Insecta	
Order	Plecoptera	
Family	Pteronarcidae	
Genus	*Pteronarcys*	
Species	*Californica*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2nd year class	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24h, 96h	
Data for multiple times?	Yes	
Effect 1	Mortality	24h, 96h
Control response 1	Not reported	
Temperature	15°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	
Purity of test substance	95% technical grade	

Reference	**Mayer & Ellersieck 1986**	***P. californica***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	Reps and # per: NR
Control	Not Reported	Reps and # per: NR
LCx; indicate calculation method	LC50=3.6 mg/L for 24h LC50=1.2 mg/L for 96h	CI: 2.8-4.7 mg/L CI: 0.9-1.7 mg/L

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Salmo clarki

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**					***S. clarki***
Parameter	**Value**					**Comment**
Test method cited	ASTM 1980, CMTTAO 1975					
Phylum	Chordata- Vertebrata					
Class	Osteichthys					
Order	Salmoniformes					
Family	Salmonidae					
Genus	*Salmo*					
Species	*clarki*					
Family in North America?	Yes					
Age/size at start of test/growth phase	1.0	0.9	1.0	0.6	0.7	15 different tests
	0.8	0.7	0.7	0.7	0.7	
	0.7	3.1	0.3	0.4	0.8	
Source of organisms	Not reported					
Have organisms been exposed to contaminants?	No					
Animals acclimated and disease-free?	Yes					
Animals randomized?	Not reported					
Test vessels randomized?	Not reported					
Test duration	24h, 96h					
Data for multiple times?	Yes					
Effect 1	Mortality					24h, 96h (both for all 15 tests)
Control response 1	Not reported					
Temperature (°C)	10	10	10	10	10	
	10	10	10	10	10	
	10	10	10	5	15	
Test type	S	S	S	S	S	S: static Deg: degradation FT: flow-through
	S	0d deg	7d deg	14d deg	21d deg	
	28d deg	FT	S	S	S	
Photoperiod/light intensity	Not Reported					

Reference	**Mayer & Ellersieck 1986**					***S. clarki***
Parameter	**Value**					**Comment**
Dilution water	Not Reported					
pH	6.5	7.5	8.5	7.8	7.7	
	7.7	7.0	7.0	7.0	7.0	
	7.0	7.4	7.2	7.4	7.2	
Hardness (mg/L)	44	44	44	44	165	
	295	44	44	44	44	
	44	162	44	44	44	
Alkalinity	Not Reported					
Conductivity	Not Reported					
Dissolved Oxygen	Not Reported					
Feeding	Not Reported					
Purity of test substance	95% technical grade					
Concentrations measured?	No					
Measured is what % of nominal?	n/a					
Chemical method documented?	n/a					
Concentration of carrier (if any) in test solutions	0.1% or less					
Concentration 1 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Control	Not Reported					Reps and # per: NR
LC50 (24h); indicate calculation method (mg/L)	>4.5	4.2 (3.1-5.7)	>4.5	>4.0	>5.0	
	>5.0	>5.0	>10.0	>20.0	>30.0	
	30.0	>4.0	3.4 (2.9-3.8)	>4.0	2.8 (1.9-4.2)	
LC50(96h); indicate calculation method (mg/L)	2.1 (1.7-2.6)	1.4 (1.0-1.9)	2.2 (1.8-2.7)	1.7 (1.4-2.1)	1.9 (1.5-2.5)	LC50 (confidence interval)
	1.9 (1.5-	1.5 (1.1-	11.5 (6.3-	13.8 (6.3-	12.8 (9.0-	

Reference	**Mayer & Ellersieck 1986**					***S. clarki***
Parameter	**Value**					**Comment**
	2.5)	2.0)	20.9)	29.9)	18.0)	
	12.3 (9.5-15.8)	1.9 (1.6-2.1)	1.4 (1.1-1.9)	1.4 (1.1-1.7)	0.71 (0.53-0.96)	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Salvelinus namaycush

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**					***S. namaycush***
Parameter	**Value**					**Comment**
Test method cited	ASTM 1980, CMTTAO 1975					
Phylum	Chordata- Vertebrata					
Class	Osteichthys					
Order	Salmoniformes					
Family	Salmonidae					
Genus	*Salvelinus*					
Species	*namaycush*					Lake Trout
Family in North America?	Yes					
Age/size at start of test/growth phase	1.5	0.4	0.4	1.0	1.0	11 different tests
	1.0	1.1	0.9	1.2	1.5	
	1.5	1.5	0.3	5.1	Swimup fry	
Source of organisms	Not reported					
Have organisms been exposed to contaminants?	No					
Animals acclimated and disease-free?	Yes					
Animals randomized?	Not reported					
Test vessels randomized?	Not reported					
Test duration	24h, 96h					
Data for multiple times?	Yes					
Effect 1	Mortality					24h, 96h (both for all 15 tests)
Control response 1	Not reported					
Temperature (°C)	10	5	15	10	10	
	10	10	10	10	10	
	10	10	10	10	10	
Test type	S	S	S	S	S	S: static Deg: degradation FT:flow-through
	S	S	S	S	7d deg	
	14d deg	21d deg	S	FT	S	

Reference	**Mayer & Ellersieck 1986**					***S. namaycush***
Parameter	**Value**					**Comment**
Photoperiod/light intensity	Not Reported					
Dilution water	Not Reported					
pH	7.0	7.5	7.5	6.5	7.5	
	8.5	8.0	8.0	8.0	7.0	
	7.0	7.0	7.0	7.4	7.0	
Hardness (mg/L)	44	44	44	44	44	
	44	44	175	295	44	
	44	44	44	162	44	
Alkalinity	Not Reported					
Conductivity	Not Reported					
Dissolved Oxygen	Not Reported					
Feeding	Not Reported					
Purity of test substance	95% technical grade					
Concentrations measured?	No					
Measured is what % of nominal?	n/a					
Chemical method documented?	n/a					
Concentration of carrier (if any) in test solutions	0.1% or less					
Concentration 1 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	Not Reported					Reps and # per: NR
Control	Not Reported					Reps and # per: NR
LC50 (24h); indicate calculation method (mg/L)	>3.5	5.3 (4.0-7.0)	2.9 (2.2-3.9)	>4.5	>4.0	LC50 (confidence interval)
	4.2 (2.8-6.2)	3.3 (2.0-5.3)	3.5 (2.8-4.4)	>3.0	>5.0	
	17.5 (10.8-28.5)	>20.0	3.5 (2.2-5.5)	n/a	4.2 (3.3-5.3)	
LC50(96h); indicate calculation method (mg/L)	2.7 (2.4-	2.2 (1.7-	1.2 (0.9-	2.5 (1.9-	2.4 (1.9-	LC50 (confidence

Reference	**Mayer & Ellersieck 1986**					***S. namaycush***
Parameter	**Value**					**Comment**
	3.0)	2.7)	1.5)	3.1)	2.9)	interval)
	2.6 (1.9-3.1)	2.2 (1.6-2.9)	2.1 (1.5-3.0)	2.6 (2.0-3.4)	3.2 (2.2-4.6)	
	3.6 (2.5-5.0)	11.5 (7.9-16.8)	1.8 (1.5-2.0)	1.8 (1.6-2.1)	1.1 (1.0-1.3)	

Other notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Sarotherodon mossambicus

Study: Reddy DC, Vijayakumari P, Kalarani V, Davies RW. 1992. Changes in erythropoietic activity of *Sarotherodon mossambicus* exposed to sublethal concentrations of the herbicide diuron. Bulletin of Environmental Contamination and Toxicology, 49:730-737.

Relevance
Score: 45 (No standard method, nonstandard endpoint, chemical purity NR, no toxicity values)
Rating: N

Toxicity Data Summary

Scenedesmus quadricauda

Study: Ma J, Lin F, Wang S, Xu L. 2003. Toxicity of 21 herbicides to the green alga *Scenedesmus quadricauda. Bulletin of Environmental Contamination and Toxicology.* 71: 594-601.

Relevance
Score: 68.5 (Nonstandard method, Low chemical purity, No control response)
Rating: N

Toxicity Data Summary

Scenedesmus quadricaudata (Turpin)

Study: Stadnyk L, Campbell RS, Johnson BT. 1971. Pesticide effect on growth and 14C assimilation in a freshwater alga. Bulletin of Environmental Contamination and Toxicology, 6:1-8.

Relevance
Score: 60 (No standard method, chemical purity NR, no toxicity values)
Rating: N

Toxicity Data Summary

Simocephalus serrulatus

Study: Mayer FL and Ellersieck MR. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Organisms of Freshwater Animals. EPA MRID 40098001. U.S. Fish and Wildlife Service. Washington, DC.

Relevance
Score: 85 (No control info)
Rating: L

Reliability
Score: 46
Rating: N

Reference	**Mayer & Ellersieck 1986**	***S. serrulatus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980, CMTTAO 1975	
Phylum	Arthropoda-- Crustacea	
Class	Branchiopoda—Phyllopoda	
Order	Diplostraca--Cladocera	
Family	Daphniidae	
Genus	*Simocephalus*	
Species	*serrulatus*	Water fleas
Family in North America?	Yes	
Age/size at start of test/growth phase	1st instar	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	15°C	
Test type	Static	
Photoperiod/light intensity	Not Reported	
Dilution water	Not Reported	
pH	7.1	
Hardness	44 mg/L	
Alkalinity	Not Reported	
Conductivity	Not Reported	
Dissolved Oxygen	Not Reported	
Feeding	Not Reported	

Reference	**Mayer & Ellersieck 1986**	***S. serrulatus***
Parameter	**Value**	**Comment**
Purity of test substance	95% technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.1% or less	
Concentration 1 Nom/Meas (µg/L)	Not Reported	NR
Concentration 2 Nom/Meas (µg/L)	Not Reported	NR
Concentration 3 Nom/Meas (µg/L)	Not Reported	NR
Concentration 4 Nom/Meas (µg/L)	Not Reported	NR
Concentration 5 Nom/Meas (µg/L)	Not Reported	NR
Control	Not Reported	NR
ECx; indicate calculation method	EC50=2.0 mg/L Confidence interval 1.4-2.8 mg/L	

Other notes:
Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).
Acceptability: Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Dilution water (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Simocephalus serrulatus

Study: Sanders HO, Cope OB. 1966. Toxicities of several pesticides to two species of cladocerans. Trans. Am. Fisheries Soc., 95:165-169.

Relevance
Score: 75 (No standard method, no control info)
Rating: L

Reliability
Score: 56.5
Rating: N

	Sanders & Cope 1966	***S. serrulatus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Diplostraca	
Family	Daphniidae	
Genus	*Simocephalus*	
Species	*serrulatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1st instar (≤ 18 h)	
Source of organisms	Lab culture after collected from a local pond	
Have organisms been exposed to contaminants?	Probably not	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Immobility	
Control response 1	NR	
Temperature	60 ± 1 °F	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	
pH	7.4-7.8	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	

	Sanders & Cope 1966	***S. serrulatus***
Parameter	**Value**	**Comment**
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Ethanol, % NR	
Concentration 1 Nom/Meas (µg/L)	# and levels NR	1 rep (?), 10/rep
Control	Not described	1 rep (?), 10/rep
EC_{50} (95% confidence interval) (µg/L)	2000 (1400-2800)	Method: Litchfield & Wilcoxon (1948)

Notes:

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Hypothesis tests (8).
Acceptability: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3).

Toxicity Data Summary

Tapes philippinarum
Ulva rigida

Study: Carafa R, Wollgast J, Canuti E, Ligthart J, Dueri S, Hanke G, Eisenreich SJ, Viaroli P, Zaldivar JM. 2007. Seasonal variations of selected herbicides and related metabolites in water, sediment, seaweed and clams in the Sacca di Goro coastal lagoon (Northern Adriatic). Chemosphere, 69:1625-1637.

N → no toxicity testing in the study