

Appendix B2

Data summary sheets for studies rated RN, LN, N

Abbreviations used in this appendix:

NR = Not Reported

Study Ratings:

RN = Relevant, Not Reliable

LN = Less Relevant, Not Reliable

N = Not Relevant

Unused lines deleted from tables

Summary sheets are in alphabetical order according to species

Toxicity Data Summary

Ampelisca abdita

Study: Anderson BD, Lowe S, Phillips BM, Hunt JW, Vorhees J, Clark S, Tjeerdema RS. 2008. "Relative sensitivities of toxicity test protocols with the amphipods *Eohaustorius estuaries* and *Ampelisca abdita*. *Ecotoxicology and Environmental Safety* **69** 24-31

Relevance

Score:

Rating: N

Reliability

Score: 32.4

Rating: N

Freshwater (15), Controls (15).

SEDIMENT ONLY, NOT RELEVANT.

Toxicity Data Summary

Aedes aegypti

Study: Beard CB, Kloter KO, Carroll MK, Magnuson LJ, Trapido H. 1985. Response of domestic and peridomestic strains of *Aedes aegypti* (Diptera:Culicidae) in New Orleans, Louisiana, USA, to organophosphate, organochlorine, and pyrethroid insecticides. J Med Entomol 22:276-280.

Relevance

Score: 85

Rating: L

Reliability

Score: 45.5

Rating: N

*Controls not mentioned

	Beard et al. 1985	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	3 strains Green/Eagle, NOMC, Rockefeller
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Green/Eagle: collected in New Orleans NOMC: lab colony since 1981 Rockefeller: lab colony since 1959	
Have organisms been exposed to contaminants?	Potentially Green/Eagle and NOMC	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 hr, 48 hr	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	28°C	
Test type	Likely static	
Photoperiod/light intensity	NR	
Dilution water	NR	

	Beard et al. 1985	<i>A. aegypti</i>
Parameter	Value	Comment
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	95%	
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, ethanol	
Concentration 1 Nom/Meas (µg/L)	NR	6-8 reps and 25/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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	NR	
LC ₅₀ (95% confidence interval) (µg/L)	Green/Eagle strain 24 h: 0.24 (0.22-0.26) 48 h: 0.35 (0.31-0.39) NOMC strain 24 h: 0.30 (0.28-0.33) 48 h: 0.34 (0.31-0.38) Rockefeller strain (susceptible) 24 h: 0.29 (0.28-0.29) 48 h: 0.28 (0.26-0.31)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -50
Acceptability (Table 3.8): Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Exposure type (2), 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), Dilution factor (2), Hypothesis tests (3). -59

Toxicity Data Summary

Aedes aegypti

Study: Failloux A-B, Ung A, Raymond M, Pasteur N. 1994. Insecticide susceptibility in mosquitoes (Diptera: Culicidae) from French Polynesia. J Med Entomol 31:639-644.

Relevance

Score: 100

Rating: R

Reliability

Score: 58.5

Rating: N

	Failloux et al. 1994	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	WHO 1975	
Phylum		
Class		
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	99%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on	Nominal	

	Failloux et al. 1994	<i>A. aegypti</i>
Parameter	Value	Comment
nominal or measured concentrations?		
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1 mL/99 mL ethanol (1%)	
Concentration 1 Nom/Meas ($\mu\text{g/L}$)	5 concentrations, NR	2-4 reps, 25/rep
Concentration 2 Nom/Meas ($\mu\text{g/L}$)	NR	2-4 reps, 25/rep
Concentration 3 Nom/Meas ($\mu\text{g/L}$)	NR	2-4 reps, 25/rep
Concentration 4 Nom/Meas ($\mu\text{g/L}$)	NR	2-4 reps, 25/rep
Concentration 5 Nom/Meas ($\mu\text{g/L}$)	NR	2-4 reps, 25/rep
Control	solvent	2-4 reps, 25/rep
LC ₅₀ (95% confidence interval) ($\mu\text{g/L}$)	Rockefeller: 4.7 (4.3-5.1) AA-PAEA: 8.7 (7.0-12.2)	Method: log-probit

Notes: Results for *Aedes polynesiensis* not reported because LC50 value (31.7 ug/L) exceeds 2x the aqueous solubility (5.5 ug/L)

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -45

Toxicity Data Summary

Aedes aegypti

Study: Liu H, Cupp EW, Guo A, Liu N. 2004. Insecticide resistance in Alabama and Florida mosquito strains of *Aedes albopictus*. Journal of Medical Entomology 41:946-952.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All LC50s (90-800 ug/L) > 2x aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Aedes aegypti

Study: Mazzarri MB, Georghiou GP. 1995. Characterization of resistance to organophosphate, carbamate, and pyrethroid insecticides in field populations of *Aedes aegypti* from Venezuela. Journal of the American Mosquito Control Association 11:315-322.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Control response not reported.

Toxicity Data Summary

Aedes aegypti

Study: Paul A, Harrington LC, Scott JG. 2006. Evaluation of novel insecticides for control of dengue vector *Aedes aegypti* (Diptera: Culicidae). J Med Entomol 43:55-60.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 57

Rating: N

*No standard method, control response not reported

	Paul et al. 2006	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	Rockefeller strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	72 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	94.7%	

	Paul et al. 2006	<i>A. aegypti</i>
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	5 concentrations	5 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Control	solvent	5 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	1.6 (1.5-1.8)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Aedes aegypti

Study: Ponlawat A, Scott JG, Harrington LC. 2005. Insecticide susceptibility of *Aedes aegypti* and *Aedes albopictus* across Thailand. J Med Entomol 42:821-825.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56

Rating: N

*No standard method, control response not reported

	Ponlawat et al. 2005	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	Mae Sot (MS) strain Nakhon Ratchasima (NR) strain Rockefeller (Rock) lab strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	MS strain: parents collected in field NR strain: parents collected in field Rock: lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	26 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	

	Ponlawat et al. 2005	<i>A. aegypti</i>
Parameter	Value	Comment
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	98%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations	3-7 tests, 2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Control	Solvent	3-7 tests, 2 reps, 10/rep
LC ₅₀ (95% confidence interval) (µg/L)	MS: 7.0 (5.8-8.3) NR: 10 (8-16) Rock: 0.7 (0.5-0.9)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -54

Toxicity Data Summary

Aedes aegypti

Study: Poupardin R, Reynaud S, Strode C, Ranson H, Vontas J, David J-P. 2008. Cross-induction of detoxification genes by environmental xenobiotics and insecticides in the mosquito *Aedes aegypti*: Impact on larval tolerance to chemical insecticides. *Insect Biochemistry and Molecular Biology* 38:540-551.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

* No standard method, Chemical purity not reported, Controls not described, response not reported

Toxicity Data Summary

Aedes aegypti

Study: Pridgeon JW, Becnel JJ, Clark GG, Linthicum KJ. 2009. A high-throughput screening method to identify potential pesticides for mosquito control. J Med Entomol 46:335-341.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 48.5

Rating: N

*No standard method, Control response not reported.

	Pridgeon et al. 2009	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	1 st instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Deionized water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Fed during test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Pridgeon et al. 2009	<i>A. aegypti</i>
Parameter	Value	Comment
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations	2 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 reps, 5/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 reps, 5/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 reps, 5/rep
Control	Solvent	2 reps, 5/rep
LC ₅₀ (95% confidence interval) (µg/L)	0.28 (0.25-0.31)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -65

Toxicity Data Summary

Aedes aegypti

Study: Riaz MA, Poupardin R, Reynaud S, Strode C, Ranson H, David J-P. 2009. Impact of glyphosate and Benzo[a]pyrene on the tolerance of mosquito larvae to chemical insecticides. Role of detoxification genes in response to xenobiotics. *Aquatic Toxicology* 93:61-69.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported. Controls not described, response not reported.

Toxicity Data Summary

Aedes aegypti

Study: Sfara V, de Licastro SA, Masuh HM, Seccacini EA, Alzogaray RA, Zerba EN. 2007. Synergism between cis-permethrin and benzoyl phenyl urea insect growth regulators against *Aedes aegypti* larvae. *Journal of the American Mosquito Control Association* 23:24-28.

Rating: N

*Test only with cis-permethrin, not racemic mixture, therefore it is not appropriate for the data set.

Toxicity Data Summary

Aedes aegypti

Study: Verma KVS, Rahman SJ. 1984. Determination of minimum lethal time of commonly used mosquito larvicides. J Com Dis 16:162-164.

Relevance

Score: 75

Rating: L

Reliability

Score: 33

Rating: N

*Unacceptable standard method, Controls not described, response not reported

	Verma & Rahman 1984	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	WHO 1963	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3 rd -early 4 th instar larvae	
Source of organisms	NR	
Have organisms been exposed to contaminants?	Unknown	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 1°C	
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	Technical grade	
Concentrations measured?	No	

	Verma & Rahman 1984	<i>A. aegypti</i>
Parameter	Value	Comment
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, ethanol	
Concentration 1 Nom/Meas (µg/L)	NR	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)		
Concentration 3 Nom/Meas (µg/L)		
Concentration 4 Nom/Meas (µg/L)		
Concentration 5 Nom/Meas (µg/L)		
Concentration 6 Nom/Meas (µg/L)		
Control	NR	
LC ₁₀₀	7.5	Method: NR

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism source (5), 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). -55

Acceptability (Table 3.8): Unacceptable standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Organism acclimation (1), Exposure type (2), 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), Statistical method (2), Hypothesis tests (3). -79

Toxicity Data Summary

Aedes aegypti

Study: Wan-Norafikah O, Nazni WA, Lee HL, Zainol-Arifin P, Sofian-Azirun M. 2010.
Permethrin resistance in *Aedes aegypti* (Linnaeus) collected from Kuala Lumpur, Malaysia.
Journal of Asia-Pacific Entomology 13:175-182.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The LC50s exceed 2x the aqueous solubility of permethrin.

Toxicity Data Summary

Aedes aegypti

Study: Wirth MC, Georghiou GP. 1999. Selection and characterization of temephos resistance in a population of *Aedes aegypti* from Tortola, British Virgin Islands. Journal of the American Mosquito Control Association 15:315-320.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 51

Rating: N

*No standard method, control response not reported

	Wirth & Georghiou 1999	<i>A. aegypti</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	Rock strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	

	Wirth & Georghiou 1999	<i>A. aegypti</i>
Parameter	Value	Comment
Purity of test substance	94.6%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	5 concentrations	5 tests, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	5 tests, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	5 tests, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	5 tests, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	5 tests, 20/rep
Control	Solvent	5 tests, 20/rep
LC ₅₀ (fiducial limits) (µg/L)	1.01 (0.78-1.31)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -60

Toxicity Data Summary

Aedes aegypti

Study: Zeichner BC, Perich MJ. 1999. Laboratory testing of a lethal ovitrap for *Aedes aegypti*.
Medical and Veterinary Entomology 13:234-238.

Relevance

Score: 42.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, No toxicity values, Control not described

Toxicity Data Summary

Atherinops affinis
Menidia beryllina

Study: Hemmer MJ, Middaugh DP, Comparetta V. 1992. Comparative acute sensitivity of larval topsmelt, *Atherinops affinis*, and inland silverside, *Menidia beryllina*, to 11 chemicals. Environ Toxicol Chem 11:401-408.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The LC50s of 25.3 and 27.5 ug/L both exceed 2x the aqueous solubility of permethrin of 5.5 ug/L

Toxicity Data Summary

Aedes albopictus

Study: Arshad Ali, J. K. Xue R-D. (1995) Comparative toxicity of selected larvicides and insect growth regulators to a Florida laboratory population of *Aedes albopictus*.

Relevance

Score: 82.5 (No std method, Control response)

Rating: L

Reliability

Score: 54.6

Rating: N

Reference	Ali & Xue 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Test method cited	Ref to Mulla et al. 1982	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	<u>Culicidae</u>	
Genus	<i>Aedes</i>	
Species	<i>albopictus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 4 th instar	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	no	
Animals acclimated and disease-free?	yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	NR	
Effect 1	mortality	
Control response 1	NR	
Temperature	26 +- 2 C	
Test type	static	
Photoperiod/light intensity	14 h	
Dilution water	tap	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	once	
Purity of test substance	94.6%	
Concentrations measured?	No	

Reference	Ali & Xue 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	1mL/100mL	
Concentration 1 Nom/Meas ($\mu\text{g/L}$)	4-9 conc	3Reps and 20 organisms per rep, test repeated 3x
Control	solvent	Reps and # per (cell density for single
LC50; indicate calculation method	0.95 $\mu\text{g/L}$ (0.82-1.1)	Log-dose-probit
LC90	3.1 $\mu\text{g/L}$ (2.5-4.0)	Log-dose-probit

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), Hypothesis tests (8)

Acceptability: Acceptable standard method (5), Control response (9), Measured concentrations within 20% Nom (4), Concentrations do not exceed 2x water solubility (4), Carrier solvent ≤ 0.5 mL/L (4), Appropriate age/size (3), Organisms randomly assigned to containers (1), Feeding (3), Exposure type (2), Dilution water source (2), Hardness (2), Alkalinity (2), Dissolved Oxygen (4), Temperature not held to $\pm 1^\circ\text{C}$ (3), Conductivity (2), pH (3), Random or block design (2), Appropriate spacing between concentrations (2), Hypothesis tests (3)

Toxicity Data Summary

Aedes albopictus

Study: Ali A, Nayar JK, Xue R-D. 1995. Comparative toxicity of selected larvicides and insect growth regulators to a Florida laboratory population of *Aedes albopictus*. Journal of the American Mosquito Control Association 11:72-76.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 57.5

Rating: N

*No standard method, control response not reported

	Ali et al. 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>albopictus</i>	
Family in North America?	yes	
Age/size at start of test/growth phase	Late 4 th instar larvae	
Source of organisms	Laboratory colony	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	26 ± 2°C	
Test type	Static	
Photoperiod/light intensity	14 h light:10 h dark	
Dilution water	Tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, once during test	1% beef liver + yeast

	Ali et al. 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Purity of test substance	94.6%	
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	1% acetone (1mL/100mL)	
Concentration 1 Nom/Meas (µg/L)	4-9 concentrations	3 tests, 3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Control	solvent	3 tests, 3 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	0.95 (0.82-1.1)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -54

Toxicity Data Summary

Aedes albopictus

Study: Ali A, Nayar JK, Xue R-D. 1995. Comparative toxicity of selected larvicides and insect growth regulators to a Florida laboratory population of *Aedes aegypti*. Journal of the American Mosquito Control Association 11:72-76.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 55

Rating: N

*No standard method, control response not reported

	Ali et al. 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>albopictus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	26 ± 2°C	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, once at beginning of test	

	Ali et al. 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Purity of test substance	94.6%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6-9 concentrations	3 tests, 3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Control	Solvent	3 tests, 3 reps, 20/rep
LC ₅₀ (95% confidence limit) (µg/L)	0.95 (0.82-1.1)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -59

Toxicity Data Summary

Aedes albopictus

Study: Gill SS. 1977. Larvicidal activity of synthetic pyrethroids against *Aedes albopictus* (Skuse). The Southeast Asian Journal of Tropical Medicine and Public Health 8:510-514.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Controls not described and response not reported

Toxicity Data Summary

Aedes albopictus

Study: Ponlawat A, Scott JG, Harrington LC. 2005. Insecticide susceptibility of *Aedes aegypti* and *Aedes albopictus* across Thailand. J Med Entomol 42:821-825.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56

Rating: N

*No standard method, control response not reported

	Ponlawat et al. 2005	<i>A. albopictus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>albopictus</i>	Nakhon Sawan (NS) strain Surat Thani (ST) strain Phatthalung (PT) strain Rockefeller (Rock) lab strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	NS strain: parents collected in field ST strain: parents collected in field PT strain: parents collected in field Rock: lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	

	Ponlawat et al. 2005	<i>A. albopictus</i>
Parameter	Value	Comment
Control response 1	0%	
Temperature	26 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	98%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations	3-7 tests, 2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3-7 tests, 2 reps, 10/rep
Control	Solvent	3-7 tests, 2 reps, 10/rep
LC ₅₀ (95% confidence interval) (µg/L)	NS: 4.1 (3.8-4.5) ST: 2 (1.8-2.2) PT: 9 (6-14) Rock: 0.7 (0.5-0.9)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -54

Toxicity Data Summary

Alburnus alburnus

Nitocra spinipes

Study: Linden E, Bengtsson B-E, Svanberg O, Sundstrom G. 1979. The acute toxicity of 78 chemicals and pesticide formulations against two brackish water organisms, the bleak (*Alburnus alburnus*) and the harpacticoid *Nitocra spinipes*. Chemosphere 11/12:843-851.

Relevance

Score: 45

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, not freshwater, low chemical purity, controls not specifically described and response not reported.

Toxicity Data Summary

Americamysis bahia

Study: Borthwick PW, Walsh GE. 1981. Initial toxicological assessment of Ambush ®, Bolero ®, Bux ®, Dursban ®, Fentrifanil ®, Larvin ®, and Pydrin ®: Static acute toxicity tests with selected estuarine algae, invertebrates, and fish. EPA-600/4-81-076. Environmental Research Laboratory, U.S. EPA, Gulf Breeze, FL.

Relevance
Score: 70
Rating: L

Reliability
Score: 52.5
Rating: N

*Saltwater, Controls not mentioned

	Borthwick et al. 1981	<i>A. bahia</i>
Parameter	Value	Comment
Test method cited	ASTM 1978	
Phylum		
Class		
Order		
Family		
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	1 d old juvenile	
Source of organisms	Lab culture	
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	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	20 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	During test to minimize	Fed 48 h old

	Borthwick et al. 1981	<i>A. bahia</i>
Parameter	Value	Comment
	cannibalism/starvation	<i>Artemia nauplii</i>
Purity of test substance	93%	
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	Reps and # per: NR
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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	NR	
LC ₅₀ (95% confidence interval) (µg/L)	96 h: 0.046 (0.032-0.056)	Method: either probit, binomial, or moving average

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8).

Acceptability (Table 3.8): 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) 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

Artemia franciscana

Brachionus plicatilis

Brachionus calyciflorus

Thamnocephalus platyurus

Study: Sanchez-Fortun S, Barahona MV. 2005. Comparative study on the environmental risk induced by several pyrethroids in estuarine and freshwater invertebrate organisms. Chemosphere 59:553-559.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Reported LC50s (220-8210 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L).

Toxicity Data Summary

Anabaena inaequalis

Study: Stratton GW, Corke CT. 1982. Toxicity of the insecticide permethrin and some degradation products toward algae and cyanobacteria. Environmental Pollution A 29:71-80.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The toxicity values reported exceeded 2x the aqueous solubility of permethrin.

Toxicity Data Summary

Anabaena inaequalis

Study: Stratton GW, Huber AL, Corke CT. 1980. The effect of pesticides and their metabolites, alone and in combination, on algal processes. Can Tech Rep Fish Aquat Sci 975:131-139.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values exceed 2x the aqueous solubility of permethrin

Toxicity Data Summary

Acropora millepora

Study: Markey KL, Baird AH, Humphrey C, Negri AP. 2007. Insecticides and a fungicide affect multiple coral life stages. Mar Ecol Prog Ser 330:127-137.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Chemical purity not reported

Toxicity Data Summary

Anopheles pseudopunctipennis

Study: Ocampo CB, Brogdon WG, Orrego CM, Toro G, Montoya-Lerma J. 2000. Insecticide susceptibility in *Anopheles pseudopunctipennis* from Colombia: Comparison between bioassays and biochemical assays. Journal of the American Mosquito Control Association 16:331-338.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 47.5

Rating: N

*Unacceptable standard method, Control response not reported.

	Ocampo et al. 2000	<i>A. pseudopunctipennis</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Anopheles</i>	
Species	<i>pseudopunctipennis</i>	4 strains: Buga, Rozo, Florida, Tulua
Family in North America?	Yes	
Age/size at start of test/growth phase	3 rd – early 4 th instar larvae	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Ocampo et al. 2000	<i>A. pseudopunctipennis</i>
Parameter	Value	Comment
Feeding	None during test	
Purity of test substance	Technical grade	
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	1% acetone or ethanol	
Concentration 1 Nom/Meas (µg/L)	4 concentrations	4 reps, 10-12/rep
Concentration 2 Nom/Meas (µg/L)	NR	4 reps, 10-12/rep
Concentration 3 Nom/Meas (µg/L)	NR	4 reps, 10-12/rep
Concentration 4 Nom/Meas (µg/L)	NR	4 reps, 10-12/rep
Control	Solvent	4 reps, 10-12/rep
LC ₅₀ (µg/L)	Buga: 0.77 (0.5-0.9) Rozo: 0.98 (0.7-1.2) Florida: 0.56 (0.5-0.6) Tulua: 1.41 (1.2-1.5)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -67

Toxicity Data Summary

Anopheles quadrimaculatus

Study: Milam CD, Farris JL, Wilhide JD. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. Arch Environ Contam Toxicol 39:324-328.

Relevance

Score: 77.5

Rating: L

Reliability

Score: 56

Rating: N

*Low chemical purity, Control response not reported

	Milam et al. 2000	<i>A. quadrimaculatus</i>
Parameter	Value	Comment
Test method cited	USEPA 1993	
Phylum		
Class		
Order		
Family		
Genus	<i>Anopheles</i>	
Species	<i>quadrimaculatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	2 nd and 3 rd instar larvae	
Source of organisms	Collected in area ditches	Arkansas
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	EPA moderately hard synthetic water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	NR, formulation called	

	Milam et al. 2000	<i>A. quadrimaculatus</i>
Parameter	Value	Comment
	Permanone	
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	No carrier used	
Concentration 1 Nom/Meas ($\mu\text{g/L}$)	NR	4 reps, 5/rep
Concentration 2 Nom/Meas ($\mu\text{g/L}$)		
Concentration 3 Nom/Meas ($\mu\text{g/L}$)		
Concentration 4 Nom/Meas ($\mu\text{g/L}$)		
Concentration 5 Nom/Meas ($\mu\text{g/L}$)		
Concentration 6 Nom/Meas ($\mu\text{g/L}$)		
Control	Dilution water	4 reps, 5/rep
LC ₅₀ ($\mu\text{g/L}$)	1.0	Method: probit, trimmed Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -36

Acceptability (Table 3.8): Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Anopheles stephensi

Study: Kumar S, Thomas A, Sahgal A, Verma A, Samuel T, Pillai MKK. 2004. Variation in the insecticide-resistance spectrum of *Anopheles stephensi* after selection with deltamethrin or a deltamethrin-piperonyl-butoxide combination. *Annals of Tropical Medicine and Parasitology* 98:861-871.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 53.5
Rating: N

*Control response not reported

	Kumar et al. 2004	<i>A. stephensi</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum		
Class		
Order		
Family	Culicidae	
Genus	<i>Anopheles</i>	
Species	<i>stephensi</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	

	Kumar et al. 2004	<i>A. stephensi</i>
Parameter	Value	Comment
Purity of test substance	≥ 94%	
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	0.4% ethanol	
Concentration 1 Nom/Meas (µg/L)	NR	4 reps, 25/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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	Solvent	4 reps, 25/rep
LC ₅₀ (95% confidence interval) (µg/L)	3.622 (3.106-4.255)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -41

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Anopheles stephensi

Study: Scott JG, Georgiou GP. 1986. Malathion-specific resistance in *Anopheles stephensi* from Pakistan. J Am Mosq Control Assoc 2:29-32.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity value exceeds 2x the aqueous solubility of permethrin.

Toxicity Data Summary

Aedes trivittatus

Study: Rubio-Moran R. 1979. Effect of permethrin and malathion on *Aedes trivittatus* and *Culex pipiens pipiens*. Master's thesis. Iowa State University, Ames, IA.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 54.5

Rating: N

*No standard method, control response not acceptable

	Rubio-Moran 1979	<i>A. trivittatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Aedes</i>	
Species	<i>trivittatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3 rd -early 4 th instar larvae	
Source of organisms	Lab reared	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 20%	
Temperature	21-26 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	98%	
Concentrations measured?	No	

	Rubio-Moran 1979	<i>A. trivittatus</i>
Parameter	Value	Comment
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	
Concentration 1 Nom/Meas (µg/L)	2-4.5 ug/L	4 reps, 20/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)	NR	
Concentration 6 Nom/Meas (µg/L)		
Control	Solvent	4 reps, 20/rep
LC ₅₀ (µg/L)	3.0 (2.7-3.3)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), 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), Dilution factor (2), Hypothesis tests (3). -53

Toxicity Data Summary

Acanthocyclops vernalis

Macrocyclops albidus

Mesocyclops ruttneri

Study: Marten GG, Che W, Bordes ES. 1993. Compatibility of cyclopoid copepods with mosquito insecticides. Journal of the American Mosquito Control Association. 9:150-154.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All toxicity values (290-1900 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L).

Toxicity Data Summary

Balanus albicostatus

Study: Feng D, Ke C, Li S, Lu C, Guo F. 2009. Pyrethroids as promising marine antifoulants: Laboratory and field studies. Mar Biotechnol 11:153-160.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*EC50 and LC50 both exceed 2x aqueous solubility

Toxicity Data Summary

Bufo americanus

Rana clamitans

Rana pipiens

Rana sylvatica

Study: Berrill M, Bertram S, Wilson A, Louis S, Brigham D, Stromberg C. 1993. Lethal and sublethal impacts of pyrethroid insecticides on amphibian embryos and tadpoles. Environ Toxicol Chem 12:525-539.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All but lowest concentration tested exceeded 2x the aqueous solubility of permethrin (5.5 ug/L), and the lowest concentration (10 ug/L) was very near 2x the aqueous solubility. There were no acceptable acute or chronic toxicity values due to the high concentrations tested.

Toxicity Data Summary

Carassius auratus

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, toxicity value not calculable, control description

Toxicity Data Summary

Cyprinodon bovinus

Cyprinodon variegatus

Gila elegans

Ptychocheilus lucius

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The toxicity values reported for these species exceed 2x the aqueous solubility.

Toxicity Data Summary

Cyprinodon bovinus

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values (18-21 ug/L) exceed 2x aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Cyprinus carpio

Study: Reddy PM, Naik SS, Bashamohideen MD. 1995. Toxicity of cypermethrin and permethrin to fish *Cyprinus carpio*. Environment & Ecology 13:30-33.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested (120-140 ug/L) exceeded 2x aqueous solubility of permethrin (5.5 ug/L).

Toxicity Data Summary

Chironomus decorus

Study: Ali A. 1981. Laboratory evaluation of organophosphate and new synthetic pyrethroid insecticides against pestiferous chironomid midges of Central Florida. 41:157-161.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 43.5

Rating: N

*No standard method, control response not reported

	Ali 1981	<i>C. decorus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	<i>Chironomus</i>	
Species	<i>decorus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Collected from pond	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 2°C	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Ali 1981	<i>C. decorus</i>
Parameter	Value	Comment
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (µg/L)	5-6 concentrations	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Dilution water	3 reps, 10/rep
LC ₅₀ (µg/L)	4.5	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8). -51

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -62

Toxicity Data Summary

Chironomus decorus
Chironomus utahensis
Procladius spp.

Study: Arshad A, Mulla MS. 1978. Declining field efficacy of chlorpyrifos against Chironomid midges and laboratory evaluation of substitute larvicides. J Econ Entomol 71:778-782.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*These tests are with cis-permethrin and cis-cypermethrin, not the racemic mixtures of these compounds, and therefore are not included for criteria calculation.

No standard method, chemical purity not reported, controls not mentioned.

Toxicity Data Summary

Ceriodaphnia dubia

Study: Liu, W., Gan, J., Lee, S., Werner, I. 2005a. Isomer selectivity in aquatic toxicity and biodegradation of bifenthrin and permethrin. *Environmental Toxicology & Chemistry* 24: 1861-1866.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Tests performed with cis-permethrin or trans-permethrin, not racemic permethrin, therefore the data cannot be used.

Toxicity Data Summary

Ceriodaphnia dubia

Daphnia magna

6 species of mussels

Study: Milam CD, Farris JL, Dwyer FJ, Hardesty DK. 2005. Acute toxicity of six freshwater mussel species (Glochidia) to six chemicals: Implications for daphnids and *Utterbackia imbecillis* as surrogates for protection of freshwater mussels (Unionidae). Arch Environ Contam Toxicol 48:166-173.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All toxicity values exceed 2x the aqueous solubility of permethrin.

Toxicity Data Summary

Ceriodaphnia dubia

Study: Liu W, Gan J, Schlenk D, Jury WA. 2005b. Enantioselectivity in environmental safety of current chiral insecticides. Proceedings of the National Academy of Sciences, 102:701-706.

Same data as reported in Liu *et al.* 2005a.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Tests performed with cis-permethrin or trans-permethrin, not racemic permethrin, therefore the data cannot be used.

Toxicity Data Summary

Ceriodaphnia dubia

Study: Milam CD, Farris JL, Wilhide JD. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. Arch Environ Contam Toxicol 39:324-328.

Relevance

Score: 77.5

Rating: L

Reliability

Score: 56

Rating: N

*Low chemical purity, Control response not reported

	Milam et al. 2000	<i>G. species</i>
Parameter	Value	Comment
Test method cited	USEPA 1993	
Phylum		
Class		
Order		
Family		
Genus	<i>Ceriodaphnia</i>	
Species	<i>dubia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h old	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	EPA moderately hard synthetic water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	NR, formulation called	

	Milam et al. 2000	<i>G. species</i>
Parameter	Value	Comment
	Permanone	
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	No carrier used	
Concentration 1 Nom/Meas (µg/L)	NR	4 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)		
Concentration 3 Nom/Meas (µg/L)		
Concentration 4 Nom/Meas (µg/L)		
Concentration 5 Nom/Meas (µg/L)		
Concentration 6 Nom/Meas (µg/L)		
Control	Dilution water	4 reps, 5/rep
LC ₅₀ (µg/L)	0.60	Method: probit, trimmed Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -36

Acceptability (Table 3.8): Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Ceriodaphnia dubia

Study: Wheelock CE, Miller JL, Miller MJ, Phillips BM, Huntley SA, Gee SJ, Tjeerdema RS, Hammock BD. 2006. Use of carboxylesterase activity to remove pyrethroid-associated toxicity to *Ceriodaphnia dubia* and *Hyalella azteca* in toxicity identification evaluations. Environ Toxicol Chem 25:973-984.

Relevance

Score: 62.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Chemical purity not reported, Toxicity value not calculable, Control not described

Toxicity Data Summary

Ceriodaphnia dubia

Study: Yang W, Spurlock F, Liu W, Gan J. 2006. Inhibition of aquatic toxicity of pyrethroid insecticides by suspended sediment. Environ Toxicol Chem 25:1913-1919.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Test with cis-permethrin, therefore data cannot be used.

Toxicity Data Summary

Cyprinodon macularius

Oncorhynchus mykiss (formerly *Salmo gairdeneri*)

Study: Mulla MS, Navvab-Gojrati HA, Darwazeh HA. 1978. Toxicity of mosquito larvicidal pyrethroids to four species of freshwater fishes. *Environmental Entomology* 7:428-430.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls not described, response not reported.

Other species were tested but the LC50s reported for them exceed 2x the aqueous solubility of permethrin, although a formulation was used.

Toxicity Data Summary

Culex pipiens pipiens

Study: Rubio-Moran R. 1979. Effect of permethrin and malathion on *Aedes trivittatus* and *Culex pipiens pipiens*. Master's thesis. Iowa State University, Ames, IA.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 54.5
Rating: N

*No standard method, control response not acceptable

	Rubio-Moran 1979	<i>C. pipiens pipiens</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Culex</i>	
Species	<i>pipiens pipiens</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3 rd -early 4 th instar larvae	
Source of organisms	Lab reared	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 20%	
Temperature	21-26 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	98%	
Concentrations measured?	No	

	Rubio-Moran 1979	<i>C. pipiens pipiens</i>
Parameter	Value	Comment
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	
Concentration 1 Nom/Meas (µg/L)	2.25-6 ug/L	4 reps, 20/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)	NR	
Concentration 6 Nom/Meas (µg/L)		
Control	Solvent	4 reps, 20/rep
LC ₅₀ (µg/L)	3.0 (2.7-3.3)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), 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), Dilution factor (2), Hypothesis tests (3). -53

Toxicity Data Summary

Culex pipiens quinquefasciatus

Study: Failloux A-B, Ung A, Raymond M, Pasteur N. 1994. Insecticide susceptibility in mosquitoes (Diptera: Culicidae) from French Polynesia. J Med Entomol 31:639-644.

Relevance
Score: 100
Rating: R

Reliability
Score: 58.5
Rating: N

	Failloux et al. 1994	<i>C. p. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1975	
Phylum		
Class		
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>pipiens quinquefasciatus</i> S-LAB	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	99%	
Concentrations measured?	No	

	Failloux et al. 1994	<i>C. p. quinquefasciatus</i>
Parameter	Value	Comment
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	1 mL/99 mL ethanol (1%)	
Concentration 1 Nom/Meas (µg/L)	5 concentrations, NR	2-4 reps, 25/rep
Concentration 2 Nom/Meas (µg/L)	NR	2-4 reps, 25/rep
Concentration 3 Nom/Meas (µg/L)	NR	2-4 reps, 25/rep
Concentration 4 Nom/Meas (µg/L)	NR	2-4 reps, 25/rep
Concentration 5 Nom/Meas (µg/L)	NR	2-4 reps, 25/rep
Control	solvent	2-4 reps, 25/rep
LC ₅₀ (95% confidence interval) (µg/L)	<i>C. p. quinquefasciatus</i> S-LAB: 10.0 (8.6-14.0)	Method: log-probit

Notes: Results for CP-PAEA strain not reported because LC50 value (21.0 ug/L) exceeds 2x the aqueous solubility (5.5 ug/L)

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -45

Toxicity Data Summary

Culex pipiens quinquefasciatus

Study: Hardstone MC, Leichter C, Harrington LC, Kasai S, Tomita T, Scott JG. 2007. Cytochrome P450 monooxygenase-mediated permethrin resistance confers limited and larval specific cross-resistance in the southern house mosquito, *Culex pipiens quinquefasciatus*. Pestic Biochem Physiol 89:175-184.

and

Hardstone MC, Leichter C, Harrington LC, Kasai S, Tomita T, Scott JG. 2008. Corrigendum to “Cytochrome P450 monooxygenase-mediated permethrin resistance confers limited and larval specific cross-resistance in the southern house mosquito, *Culex pipiens quinquefasciatus*.” [Pestic Biochem Physiol (2007) 89:175-184] Pestic Biochem Physiol 91:191.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 55
Rating: N

*No standard method, Control response not reported

	Hardstone et al. 2007	<i>C. pipiens quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Culex</i>	
Species	<i>pipiens quinquefasciatus</i> Say SLAB	SLAB: susceptible lab strain
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Laboratory cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25°C	
Test type	Static	

	Hardstone et al. 2007	<i>C. pipiens quinquefasciatus</i>
Parameter	Value	Comment
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during tests	
Purity of test substance	98%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	1% (1 mL/99 mL) acetone	
Concentration 1 Nom/Meas (µg/L)	At least 3 concentrations	At least 5 tests, at least 3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	At least 5 tests, at least 3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	At least 5 tests, at least 3 reps, 20/rep
Control	solvent	At least 5 tests, at least 3 reps, 20/rep
LC ₅₀ (µg/L)	SLAB: 1.7 (1.5-1.9)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Organism acclimation (1), Exposure type (2), 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), Dilution factor (2), Hypothesis tests (3). -56

Toxicity Data Summary

Culex pipiens quinquefasciatus

Hardstone MC, Leichter C, Harrington LC, Kasai S, Tomita T, Scott JG. 2008. Corrigendum to “Cytochrome P450 monooxygenase-mediated permethrin resistance confers limited and larval specific cross-resistance in the southern house mosquito, *Culex pipiens quinquefasciatus*.” *Pest Biochem Physiol* 91:191-191.

Previous citation it to correction with some corrected LC50s. Original article:

Hardstone MC, Leichter C, Harrington LC, Kasai S, Tomita T, Scott JG. 2007. Cytochrome P450 monooxygenase-mediated permethrin resistance confers limited and larval specific cross-resistance in the southern house mosquito, *Culex pipiens quinquefasciatus*. *Pest Biochem Physiol* 89:175.

Not relevant

Study reports LC50s of 3.5 and 5.2 ug/L for susceptible and resistant strains but these were not really aqueous exposures. From the methods section:

"Adult mosquito bioassays were conducted in glass jars (230 ml, internal surface area of 180 cm²) treated with 1 ml of insecticide solution (or 1 ml of acetone for controls), which was evenly coated on the inner walls."

Toxicity Data Summary

Culex pipiens

Study: Mansour SA, Messeha SS, El-Gengaihi SE. 2000. Botanical biocides 4. Mosquitocidal activity of certain *Thymus capitatus* constituents. Journal of Natural Toxins 9:49-62.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Unacceptable standard method (WHO 1971), Low chemical purity, Controls not described.

Toxicity Data Summary

Culex pipiens

Study: Wirth MC, Georghiou GP. 1996. Organophosphate resistance in *Culex pipiens* from Cyprus. Journal of the American Mosquito Control Association 12:112-118.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 51

Rating: N

*No standard method, control response not reported.

	Wirth & Georghiou 1996	<i>C. pipiens</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>pipiens</i>	3 strains S-lab Paphos Milas
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Wirth & Georghiou 1996	<i>C. pipiens</i>
Parameter	Value	Comment
Feeding	None during test	
Purity of test substance	94.6%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	At least 5 concentrations	5 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	5 reps, 20/rep
Control	Solvent	5 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	S-lab: 0.88 Paphos:4.14 Milas: 8.65	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -60

Toxicity Data Summary

Culex quinquefasciatus

Study: Ali A, Chowdhury MA, Hossain MI, Ameen MU, Habiba DB, Aslam AFM. 1999. Laboratory evaluation of selected larvicides and insect growth regulators against field-collected *Culex quinquefasciatus* larvae from urban Dhaka, Bangladesh. Journal of the American Mosquito Control Association 15:43-47.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 53
Rating: N

*No standard method, control response not reported

	Ali et al. 1999	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	28 ± 3°C	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, once at beginning of	

	Ali et al. 1999	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
	test	
Purity of test substance	94.6%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6-9 concentrations	3 tests, 3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 tests, 3 reps, 20/rep
Control	Solvent	3 tests, 3 reps, 20/rep
LC ₅₀ (95% confidence limit) (µg/L)	5 (3-9)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Feeding (3), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -63

Toxicity Data Summary

Culex quinquefasciatus

Study: Corbel V, Chandre F, Darriet F, Lardeux F, Hougard J-M. 2003. Synergism between permethrin and propoxur against *Culex quinquefasciatus* mosquito larvae. Medical and Veterinary Entomology 17:158-164.

Relevance

Score: 92.5

Rating: R

Reliability

Score: 58

Rating: N

*Control response not reported

	Corbel et al. 2003	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1970	
Phylum		
Class		
Order	Culicidae	
Family	Diptera	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	S-lab strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3 rd and early 4 th instar larvae	
Source of organisms	Lab colony	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Corbel et al. 2003	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Feeding	NR	
Purity of test substance	94.4%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	1 mL ethanol/99 mL dilution water	
Concentration 1 Nom/Meas (µg/L)	5-8 concentrations	5 tests with 3 reps each, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	5 tests with 3 reps each, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	5 tests with 3 reps each, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	5 tests with 3 reps each, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	5 tests with 3 reps each, 20/rep
Control	Solvent	5 tests with 3 reps each, 20/rep
LC ₅₀ (µg/L)	1.5	Method: log-probit

Notes: also tests mixtures with the carbamate propoxur

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -50

Toxicity Data Summary

Culex quinquefasciatus

Study: Kasai S, Weerashinghe IS, Shono T. 1998. P450 monooxygenases are an important mechanism of permethrin resistance in *Culex quinquefasciatus* Say larvae. Archives of Insect Biochemistry and Physiology 37:47-56.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 58

Rating: N

*Standard method not acceptable, Control response not reported

	Kasai et al. 1998	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	91.2%	

	Kasai et al. 1998	<i>C. quinquefasciatus</i>
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	≤ 1% alcohol	
Concentration 1 Nom/Meas (µg/L)	NR	3reps, 20-30/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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	Solvent	3reps, 20-30/rep
LC ₅₀ (µg/L)	4.0 (3.0-4.0)	Method: log-probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -50

Toxicity Data Summary

Culex quinquefasciatus

Study: Khayrandish A, Wood RJ. 1993. Organophosphorus insecticide resistance in a new strain of *Culex quinquefasciatus* (Diptera: Culicidae) from Tanga, Tanzania. Bulletin of Entomological Research 83:67-74.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56

Rating: N

*Unacceptable standard method, control response not reported

	Khayrandish & Wood 1993	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1975	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	2 strains: TANGA RANGOON
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Lab colony	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Khayrandish & Wood 1993	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Feeding	None during test	
Purity of test substance	96.9%	
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	1% ethanol	
Concentration 1 Nom/Meas (µg/L)	8-10 concentrations	10 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	10 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	10 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	10 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	10 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	10 reps, 20/rep
Control	Solvent	10 reps, 20/rep
LC ₅₀ (µg/L)	TANGA: 4.4 RANGOON: 2.2	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -54

Toxicity Data Summary

Culex quinquefasciatus

Study: Li T, Lan Q, Liu N. 2009. Larvicidal activity of mosquito sterol carrier protein-2 inhibitors to the insecticide-resistant mosquito *Culex quinquefasciatus* (Diptera: Culicidae). Journal of Medical Entomology 46:1430-1435.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 54.5

Rating: N

*No standard method, control response not reported

	Li et al. 2009	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	-Say strain (susceptible) -MAMCq G2 strain (selected for permethrin resistance for 2 generations) -HAMCq G9 (selected for permethrin resistance for 9 generations)
Family in North America?	Yes	
Age/size at start of test/growth phase	2 nd instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	Not clear, clarify with authors
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	

	Li et al. 2009	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Temperature	25°C	
Test type	Static	
Photoperiod/light intensity	NR during test, reared at 12:12	
Dilution water	Tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.3%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	3-4 concentrations	4 reps, 30/rep
Concentration 2 Nom/Meas (µg/L)	NR	4 reps, 30/rep
Concentration 3 Nom/Meas (µg/L)	NR	4 reps, 30/rep
Concentration 4 Nom/Meas (µg/L)	NR	4 reps, 30/rep
Control	Solvent	4 reps, 30/rep
LC ₅₀ (95% confidence interval) (µg/L)	S-LAB strain: 0.6 (0.4-0.9) MAMCq G2 strain: 4 (2-5) BAMCq strain: 8 (4-20)	Method: probit

Notes: LC₅₀ for HAMCq G9 strain (70 µg/L) was not reported because it was > 2x aqueous solubility of permethrin (5.5 µg/L)

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), 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), Dilution factor (2), Hypothesis tests (3). -57

Toxicity Data Summary

Culex quinquefasciatus

Study: Liu H, Cupp EW, Micher KM, Guo A, Liu N. 2004b. Insecticide resistance and cross-resistance in Alabama and Florida strains of *Culex quinquefasciatus*. J Med Entomol 41:408-413.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 54.5

Rating: N

*No standard method, control response not reported

	Liu et al. 2004b	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited		
Phylum		
Class		
Order		
Family		
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	S-Lab strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.3%	

	Liu et al. 2004b	<i>C. quinquefasciatus</i>
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	3-4 concentrations	3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Control	Solvent	3 reps, 20/rep
LC50 (95% confidence interval) (µg/L)	S-Lab: 8 (6-10)	Method: probit

Notes: Other strains were tested but those LC50s exceeded 2x the aqueous solubility of permethrin

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), 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), Dilution factor (2), Hypothesis tests (3). -57

Toxicity Data Summary

Culex quinquefasciatus

Study: Mulla MS, Navvab-Gojrati HA, Darwazeh HA. 1978. Biological activity and longevity of new synthetic pyrethroids against mosquitoes and some nontarget insects. Mosquito News 38:90-96.

Relevance

Score: 75

Rating: L

Reliability

Score: 41.5

Rating: N

*No standard method, Controls not described, response not reported

	Mulla et al. 1978	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	Technical grade	

	Mulla et al. 1978	<i>C. quinquefasciatus</i>
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	NR	2 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)		
Concentration 3 Nom/Meas (µg/L)		
Concentration 4 Nom/Meas (µg/L)		
Concentration 5 Nom/Meas (µg/L)		
Concentration 6 Nom/Meas (µg/L)		
Control	NR	
LC ₅₀ (µg/L)	1.40	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -46

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -71

Toxicity Data Summary

Culex quinquefasciatus

Study: Scott JG, Mellon RB, Kirino O, Georghiou GP. 1986. Insecticidal activity of substituted benzyl dichlorovinylcyclopropanecarboxylates on susceptible and kdr-resistant strains of the southern house mosquito, *Culex quinquefasciatus*. J Pesticide Sci 11:475-477.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity value (16 ug/L) exceeds 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Culex quinquefasciatus

Study: Vijayan VA, Ningegowda N. 1993. Susceptibility difference in two populations of *Culex quinquefasciatus* Say (Diptera: Culicidae) to three synthetic pyrethroids. Southeast Asian J Trop Med Public Health 24:540-543.

Relevance

Score: 75

Rating: L

Reliability

Score: 54.5

Rating: N

*Unacceptable standard method, Low chemical purity

	Vijayan & Ningegowda 1993	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	Strains: Mysore Mandya
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Originally collected in field	
Have organisms been exposed to contaminants?	Not known	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	26 ± 2°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

	Vijayan & Ningegowda 1993	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	25%	
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	0.08% acetone	
Concentration 1 Nom ($\mu\text{g/L}$)	2.0	4-6 reps, 25/rep
Concentration 2 Nom ($\mu\text{g/L}$)	4.0	4-6 reps, 25/rep
Concentration 3 Nom ($\mu\text{g/L}$)	6.0	4-6 reps, 25/rep
Concentration 4 Nom ($\mu\text{g/L}$)	8.0	4-6 reps, 25/rep
Control	Solvent	4-6 reps, 25/rep
LC ₅₀ ($\mu\text{g/L}$)	Mysore: 4.54 Mandya: 4.8	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): Unacceptable standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), 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), Hypothesis tests (3). -60

Toxicity Data Summary

Culex quinquefasciatus

Study: Weerasinghe IS, Kasai S, Shono T. 2001. Correlation of pyrethroid structure and resistance level in *Culex quinquefasciatus* Say from Saudi Arabia. J Pesticide Sci 26:158-161.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 54

Rating: N

*Unacceptable standard method, No control response

	Weerasinghe et al. 2001	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1981	Not acceptable
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	91.2%	
Concentrations measured?	No	

	Weerasinghe et al. 2001	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
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	≤ 1% ethanol	
Concentration 1 Nom/Meas (µg/L)	Not reported	3 reps, 20-30/rep
Concentration 2 Nom/Meas (µg/L)	Not reported	
Concentration 3 Nom/Meas (µg/L)	Not reported	
Concentration 4 Nom/Meas (µg/L)	Not reported	
Concentration 5 Nom/Meas (µg/L)	Not reported	
Concentration 6 Nom/Meas (µg/L)	Not reported	
Control	Solvent	3 reps, 20-30/rep
LC ₅₀ (95% confidence limit) (µg/L)	4.0 (3.0-4.0)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -58

Toxicity Data Summary

Culex quinquefasciatus

Study: Xu Q, Liu H, Zhang L, Liu N. 2005. Resistance in the mosquito, *Culex quinquefasciatus*, and possible mechanisms for resistance. *Pest Manag Sci* 61:1096-1102.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 53

Rating: N

*No standard method, Control response not reported

	Xu et al. 2005	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>quinquefasciatus</i>	Say (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.3%	
Concentrations measured?	No	

	Xu et al. 2005	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	4-5 concentrations	3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 20/rep
Control	Solvent	3 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	Test 1: 8 (6-10) Test 2: 9 (7-10)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), 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), Dilution factor (2), Hypothesis tests (3). -60

Toxicity Data Summary

Chironomus riparius

Study: Conrad AU, Fleming RJ, Crane M. 1999. Laboratory and field response of *Chironomus riparius* to a pyrethroid insecticide. Water Research 33:1603-1610.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, low chemical purity, control response not reported

96 h LC50: 2.89 (std dev 0.18)

Toxicity Data Summary

Chironomus riparius

Study: Ibrahim H, Kheir R, Helmi S, Lewis J, Crane M. 1998. Effects of organophosphorus, carbamate, pyrethroid and organochlorine pesticides, and a heavy metal on survival and cholinesterase activity of *Chironomus riparius* Meigen. Bull Environ Contam Toxicol 60:448-455.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 16.6 ug/L exceeds 2x aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Chironomus salinarius

Study: Ali A, Majori G, Ceretti G, D'Andrea F, Scattolin M, Ferrarese U. 1985. A chironomid (Diptera:Chironomidae) midge population study and laboratory evaluation of larvicides against midges inhabiting the lagoon of Venice, Italy. J Am Mosq Control Assoc 1:63-68.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, saltwater, Controls not described, response not reported

Toxicity Data Summary

Crangon septemspinosa
Homarus americanus

Study: McLeese DW, Metcalfe CD, Zitko V. 1980. Lethality of permethrin, cypermethrin and fenvalerate to salmon, lobster and shrimp. Bull Environ Contam Toxicol 25:950-955.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Controls not described and response not reported.

Toxicity Data Summary

Culex tarsalis

Study: Whyard S, Downe AER, Walker VK. 1994. Isolation of an esterase conferring insecticide resistance in the mosquito *Culex tarsalis*. Insect Biochem Molec Biol 24:819-827.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Control response not reported.

Toxicity Data Summary

Culex tritaeniorhynchus

Study: Reza FM, Vijayan VA. 2006. Differential tolerance of two morphological variants of *Culex tritaeniorhynchus* (Diptera: Culicidae), a Japanese encephalitis vector, to pyrethroid insecticides in Mysore, India. Southeast Asian J Top Med Public Health 37:128-131.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 48

Rating: N

*Unacceptable standard method, unacceptable control response (<20%)

	Reza & Vijayan 2006	<i>C. tritaeniorhynchus</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>tritaeniorhynchus</i>	2 strains: Type A Type B
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4 th instar larvae	
Source of organisms	Collected in the field in Mysore, India area	
Have organisms been exposed to contaminants?	Unknown	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	<20%	
Temperature	Culture conditions: 28 ± 2°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated water	
pH	NR	
Hardness	NR	
Alkalinity	NR	

	Reza & Vijayan 2006	<i>C. tritaeniorhynchus</i>
Parameter	Value	Comment
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	94.7%	
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	0.08% absolute alcohol	
Concentration 1 Nom/Meas (µg/L)	Range: 0.2-11.2	3 reps, 25/rep
Concentration 2 Nom/Meas (µg/L)		
Concentration 3 Nom/Meas (µg/L)		
Concentration 4 Nom/Meas (µg/L)		
Concentration 5 Nom/Meas (µg/L)		
Concentration 6 Nom/Meas (µg/L)		
Control	Solvent	
LC ₅₀	Type A: 2.65 (1.46-4.67) Type B: 2.28 (1.93-2.63)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -38

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -66

Toxicity Data Summary

Cyprinodon variegatus

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values (17-22 ug/L) exceed 2x aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Crassostrea virginica

Study: Borthwick PW, Walsh GE. 1981. Initial toxicological assessment of Ambush ®, Bolero ®, Bux ®, Dursban ®, Fentrifanil ®, Larvin ®, and Pydrin ®: Static acute toxicity tests with selected estuarine algae, invertebrates, and fish. EPA-600/4-81-076. Environmental Research Laboratory, U.S. EPA, Gulf Breeze, FL.

Relevance

Score: 62.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Saltwater, No toxicity value, Control response not reported
EC50 values > 2x aqueous solubility

Toxicity Data Summary

Crassostrea gigas

42723301. Thompson RS, Sankey SA. 1993. Permethrin: acute toxicity of a 10% EC formulation to larvae of the Pacific oyster (*Crassostrea gigas*) Brixham Environmental Laboratory, Brixham, UK, Rept No BL4689/B. Doc No. C834.

Relevance

Score:

Rating: N

Reliability

Score:

Rating:

This study is rated N because the calculate LC50 exceeds the water solubility of permethrin (Solubility: 5-6 µg/L, 48 hr EC50: 6.5 mg/L).

Toxicity Data Summary

Crassostrea gigas

Thompson RS, Hill RW & Cornish SK. (1977). "Investigation of the acute toxicity of PP 557 to the Pacific Oyster (*Crassostrea gigas*)". Brixham Laboratory.

Relevance

Score: 60

Rating: N

Reliability

Score:

Rating:

Relevance Points taken off for: Standard method (10), Freshwater (15), Toxicity values (15).

Toxicity Data Summary

Cyprinodon variegatus

42608201. Sankey SA, Morris DS, Caunter JE, Stanley RD. 1992. Permethrin: acute toxicity to sheepshead minnow (*Cyprinodon variegatus*) of a 10% EC formulation. Brixham Environmental Laboratory, Brixham, UK, Rept No BL4564/B. Doc No. C820.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

This study was rated N because LC50s found exceed the water solubility of permethrin. (LC50 for all time points (24-96 hr): >300 µg/L)

Toxicity Data Summary

Crassostrea virginica

Study: EG&G, Inc. 1975. Acute toxicity of FMC 33297 technical (95.7%) to eastern oysters (*Crassostrea virginica*), pink shrimp (*Penaeus duorarum*), and fiddler crabs (*Uca pugilator*).

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

Relevance Points taken off for:

Standard method (10), Freshwater (15), Toxicity values not calculable (15)

Toxicity Data Summary

Daphnia magna
Daphnia pulex
Hydropsyche spp.
Isonychia bicolor
Simulium vittatum

Study: Sibley PK, Kaushik NK. 1991. Toxicity of microencapsulated permethrin to selected nontarget aquatic invertebrates. Arch Environ Contam Toxicol 20:168-176.

Relevance

Score: Acute: 67.5 Chronic: 60
Rating: N

Reliability

Score: n/a
Rating: n/a

* Acute: No standard method, Low chemical purity, Control response not reported.
Chronic: No standard method, Low chemical purity, Toxicity values not calculable.

Toxicity Data Summary

Daphnia magna

Kent SJ, Sankey SA & Grinell AJ. (1992). Permethrin: Acute toxicity to *Daphnia magna* of a 10% EC formulation. EPA MRID: 42584002

Relevance

Score:

Rating: N

Reliability

Score:

Rating:

LC50s exceed the water solubility of permethrin (5.5-6 µg/L).

<u>Hr</u>	<u>LC50 (µg/L)</u>
24	>37
48	9.9

Toxicity Data Summary

Daphnia magna

Study: Liu W, Gan J, Schlenk D, Jury WA. 2005b. Enantioselectivity in environmental safety of current chiral insecticides. Proceedings of the National Academy of Sciences, 102:701-706.

Same data as reported in Liu *et al.* 2005a.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Tests not performed with racemic permethrin, therefore the results cannot be used.

Toxicity Data Summary

Daphnia magna

Study: Stratton GW, Corke CT. 1981. Interaction of permethrin with *Daphnia magna* in the presence and absence of particulate material. Environmental Pollution A 24:135-144.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 57.5

Rating: N

*No standard method, control response not reported

	Stratton & Corke 1981	<i>D. magna</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile (1-2 mm long) or adult (3-5 mm long)	
Source of organisms	Collected from a small pond	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	20 ± 2°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered river water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	Technical grade	

	Stratton & Corke 1981	<i>D. magna</i>
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	0.05% acetone	
Concentration 1 Nom/Meas (µg/L)	Concentrations ranged 0-10 µg/L	3 reps, 10/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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	Solvent	3 reps, 10/rep
LC ₅₀ (µg/L)	Juvenile: 0.2 Adult: 0.6	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -51

Toxicity Data Summary

Daphnia magna

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, toxicity value not calculable, control description

Toxicity Data Summary

Daphnia magna

Study: USEPA. 1979. Biological report of analysis. TN 2420.

Relevance

Score: 100

Rating: R

Reliability

Score: 51.5

Rating: N

	USEPA 1979	<i>D. magna</i>
Parameter	Value	Comment
Test method cited	ASTM	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	TABU stock colonies	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	28 d	
Data for multiple times?	No	
Effect 1	Production of young/adult	
Control response 1	64.2	
Effect 2	Survival	
Control response 2	94.5%	
Temperature	NR	
Test type	NR	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	94.4%	
Concentrations measured?	NR	
Measured is what % of nominal?	n/a	

	USEPA 1979	<i>D. magna</i>
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	%NR, acetone	
Concentration 1 Nom (µg/L)	0.017	4 reps, 5/rep
Concentration 2 Nom (µg/L)	0.035	4 reps, 5/rep
Concentration 3 Nom (µg/L)	0.07	4 reps, 5/rep
Concentration 4 Nom (µg/L)	0.14	4 reps, 5/rep
Concentration 5 Nom (µg/L)	0.28	4 reps, 5/rep
Concentration 6 Nom (µg/L)	0.56	4 reps, 5/rep
Control	Solvent and dilution water	4 reps, 5/rep
EC ₅₀ (µg/L)	48 hr: 0.70	Method: NR
NOEC (µg/L)	0.28	Method: NR p: 0.05 MSD: NR
LOEC (µg/L)	0.56	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	0.40	
% of control at NOEC	62.8/64.2=98%	
% of control at LOEC	56.5/64.2=88%	

Notes: interrupted dose response

Reliability points taken off for:

Documentation (Table 3.7): Organism age (5), Analytical method (4), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Minimum significant difference (2). -47

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Feeding (3), Organism acclimation (1), Exposure type (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Statistical method (2), Minimum significant difference (1). -50

Toxicity Data Summary

Danio rerio

Study: DeMicco A, Cooper KR, Richardson JR, White LA. 2010. Developmental neurotoxicity of pyrethroid insecticides in zebrafish embryos. *Toxicological Sciences* 113:177-186.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 300 ug/L > 2x aqueous solubility (5.5. ug/L)

Toxicity Data Summary

Danio rerio

Study: Jin Y, Wang W, Xu C, Fu Z, Liu W. 2008. Induction of hepatic estrogen-responsive gene transcription by permethrin enantiomers in male adult zebrafish. *Aquatic Toxicology* 88:146-152.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Endpoint not linked to survival/growth/reproduction, Toxicity value not calculable

Toxicity Data Summary

Daphnia magna

Evered P & Doma S. (1977). "PP 557: Acute toxicity of emulsifiable concentrate (JFU 5054) to first instar *Daphnia magna*". ICI Plant Protection Division.

Relevance

Score: 85

Rating: L

Reliability

Score:

Rating: N

Relevance Points taken off for: Chemical purity (15), Control described (7.5)

Reference	Evered et al, 1977	<i>D. magna</i>
Parameter	Value	Comment
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	First 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	48 hr	
Data for multiple times?	Yes	24, 48 hr
Effect 1	Immobility	
Control response 1		
Temperature	18±2°C	
Test type	Static	
Photoperiod/light intensity	30 watt warm white, 3500 lux	
Dilution water	NR	
pH	8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Reference	Evered et al, 1977	<i>D. magna</i>
Parameter	Value	Comment
Dissolved Oxygen	>60% saturation	
Feeding	Not fed	
Purity of test substance	24% w/v	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	Highest - 20 mL/L	
Concentration 1 Nom ($\mu\text{g/L}$)	20, 10, 5, 2, 1, 0.5, 0.2, 0.1, 0.05	3 Reps and 10 organisms per rep, test repeated 3x
Control		3 Reps and 10 per
LC50; indicate calculation method	24 hr 1.93 (1.76-2.12) 48 hr 1.31 (1.17-1.48)	Log-dose-probit

Reliability points taken off for:

Documentation: Control type (8), Organism source (5), Analytical method (4), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8).

Acceptability: Control description (6), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Temperature not held to $\pm 1.0^\circ\text{C}$ (3), Conductivity (1), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3).

Toxicity Data Summary

Daphnia magna

Study: **00047033**. Forbis AD, McAllister WA. 1980. Chronic toxicity of 14C-permethrin to *Daphnia magna* under flow-through test conditions. Analytical Bio-Chemistry Laboratories Report #23647. Doc No. C859.

Location: caitlin1.pdf pg 142-143

Relevance

Score: 60

Rating: L

Reliability

Score: 17.5

Rating: N

Acceptable method (10), Purity (15), Control (15)

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
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	3 weeks	
Data for multiple times?	NR	
Mortality		
Control response	NR	
Effect 2		
Temperature	NR	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	NR	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)		Reps and # per (cell density for single-celled organisms):
Concentration 2 Nom/Meas (µg/L)	.029	
Concentration 3 Nom/Meas (µg/L)	.06	
Concentration 4 Nom/Meas (µg/L)	.118	
Concentration 5 Nom/Meas (µg/L)	.271	
Concentration 6 Nom/Meas (µg/L)	.608	
Control	NR	
NOEC (µg/L)	0.060	
LOEC (µg/L)	0.118	
MATC (GeoMean NOEC,LOEC) (µg/L)	0.084	
% of control at NOEC	NR	
% of control at LOEC	NR	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Exposure duration (12), Control type (8), Organism source (5), Organism age (5), Chemical purity (5), Analytical method (4), Nominal concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8), Minimum significant difference (2), % control of NOEC/LOEC (2), Point estimates (8).

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Organism acclimation (1), Exposure type (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3), Minimum significant difference (1), Point estimates (3).

Toxicity Data Summary

Daphnia magna

Yang, W.; Gan, J.; Hunter, W.; Spurlock, F. Effect of suspended solids on bioavailability of pyrethroid insecticides; *Environ. Tox. & Chem.* **2006**, *6*, 1585-1591.

Relevance

Score: 60

Rating: N

Reliability

Score:

Rating:

Relevance Points taken off for: Acceptable standard (10), Endpoint (15), Toxicity values calculable (15).

Toxicity Data Summary

Gambusia affinis

Study: Milam CD, Farris JL, Wilhide JD. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. Arch Environ Contam Toxicol 39:324-328.

Relevance

Score: 77.5

Rating: L

Reliability

Score: 56

Rating: N

*Low chemical purity, Control response not reported

	Milam et al. 2000	<i>G. affinis</i>
Parameter	Value	Comment
Test method cited	USEPA 1993	
Phylum		
Class		
Order		
Family		
Genus	<i>Gambusia</i>	
Species	<i>affinis</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	7-14 d old	
Source of organisms	Collected in area ditches	Arkansas
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	EPA moderately hard synthetic water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	NR, formulation called	

	Milam et al. 2000	<i>G. affinis</i>
Parameter	Value	Comment
	Permanone	
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	No carrier used	
Concentration 1 Nom/Meas ($\mu\text{g/L}$)	NR	4 reps, 5/rep
Concentration 2 Nom/Meas ($\mu\text{g/L}$)		
Concentration 3 Nom/Meas ($\mu\text{g/L}$)		
Concentration 4 Nom/Meas ($\mu\text{g/L}$)		
Concentration 5 Nom/Meas ($\mu\text{g/L}$)		
Concentration 6 Nom/Meas ($\mu\text{g/L}$)		
Control	Dilution water	4 reps, 5/rep
LC ₅₀ ($\mu\text{g/L}$)	2.7	Method: probit, trimmed Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -36

Acceptability (Table 3.8): Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Gambusia holbrooki

Study: Tietze NS, Hester PG, Shaffer KR. 1995. Acute effects of Permanone® 31-66 (permethrin-piperonyl butoxide) on nontarget minnows and grass shrimp. Journal of American Mosquito Control Association 11:476-479.

Relevance

Score: 75

Rating: L

Reliability

Score: 58.5

Rating: N

*No standard method, Low chemical purity

	Tietze et al. 1995	<i>G. holbrooki</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cyprinodontiformes	
Family	Poeciliidae	
Genus	<i>Gambusia</i>	
Species	<i>holbrooki</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	2-5 d old	
Source of organisms	Reared in field ponds at research lab	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	Yes, 24 h	
Effect 1	Mortality	
Control response 1	< 5%	
Temperature	27 ± 0.5°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	Unfiltered well water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	

	Tietze et al. 1995	<i>G. holbrooki</i>
Parameter	Value	Comment
Purity of test substance	31.28%	
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	1% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations	6 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	NR	6 reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	NR	6 reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	NR	6 reps, 5/rep
Concentration 5 Nom/Meas (µg/L)	NR	6 reps, 5/rep
Concentration 6 Nom/Meas (µg/L)	NR	6 reps, 5/rep
Control	Solvent	6 reps, 5/rep
LC ₅₀ (95% confidence interval) (µg/L)	24 h: 6.04 (5.77-6.27) 48 h: 4.29 (4.16-4.39)	Method: probit

Notes: the formulation used (Permanone) also contained piperonyl butoxide, which is known to synergize pyrethroid toxicity.

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Organism acclimation (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -52

Toxicity Data Summary

Goeldichironomus holoprasinus

Study: Ali A. 1981. Laboratory evaluation of organophosphate and new synthetic pyrethroid insecticides against pestiferous chironomid midges of Central Florida. 41:157-161.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 43.5

Rating: N

*No standard method, control response not reported

	Ali 1981	<i>G.holoprasinus</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	<i>Goeldichironomus</i>	
Species	<i>holoprasinus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Collected from pond	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 2°C	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Ali 1981	<i>G.holoprasinus</i>
Parameter	Value	Comment
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (µg/L)	5-6 concentrations	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Dilution water	3 reps, 10/rep
LC ₅₀ (µg/L)	1.4	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8). -51

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -62

Toxicity Data Summary

Glyptotendipes paripes

Study: Ali A. 1981. Laboratory evaluation of organophosphate and new synthetic pyrethroid insecticides against pestiferous chironomid midges of Central Florida. 41:157-161.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 43.5

Rating: N

*No standard method, control response not reported

	Ali 1981	<i>G. paripes</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Scarabaeoidea	
Genus	<i>Glyptotendipes</i>	
Species	<i>paripes</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Collected from pond	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	27 ± 2°C	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Ali 1981	<i>G. paripes</i>
Parameter	Value	Comment
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (µg/L)	5-6 concentrations	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Dilution water	3 reps, 10/rep
LC ₅₀ (µg/L)	2.4	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8). -51

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -62

Toxicity Data Summary

Gammarus pulex

Study: Abel PD, Garner SM. 1986. Comparisons of median survival times and median lethal exposure times for *Gammarus pulex* exposed to cadmium, permethrin and cyanide. Wat Res 20:579-582.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*no standard method, no toxicity values, control response not reported, some test concentrations > 2x solubility

Toxicity Data Summary

Study: Gan J, Lee SJ, Liu WP, Haver DL, Kabashima JN. 2005. Distribution and persistence of pyrethroids in runoff sediments. J Environ Qual 34:836-841.

Relevance

Score: 45

Rating: N

Reliability

Score: n/a

Rating: n/a

Relevance Points taken off for: Standard method (10), Endpoint (15), Toxicity values (15), Controls (15).

Toxicity Data Summary

Gómez-Gutiérrez A.; Jover E.; Bayona J. M.; Albaigés J. Influence of water filtration on the determination of a wide range of dissolved contaminants at parts-per-trillion levels. *Analytica Chimica Acta*, **2007**, 583, 202-209.

Relevance

Score: 45

Rating: N

Reliability

Score:

Rating:

Relevance Points taken off for: Standard method (10), Endpoint (15), Toxicity values (15), Controls (15).

Toxicity Data Summary

Homarus americanus

Salmo salar

Study: Zitko V, McLeese DW, Metcalfe CD, Carson WG. 1979. Toxicity of permethrin, decamethrin, and related pyrethroids to salmon and lobster. Bull Environm Contam Toxicol 21:338-343.

Relevance

Score: 60 (salmon), 45 (lobster)

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, saltwater (lobster), chemical purity not reported, Controls not described, response not reported

Toxicity Data Summary

Hyalella azteca

Study: Wheelock CE, Miller JL, Miller MJ, Phillips BM, Gee SJ, Tjeerdema RS, Hammock BD. 2005. Influence of container adsorption upon observed pyrethroid toxicity to *Ceriodaphnia dubia* and *Hyalella azteca*. *Aquatic Toxicology* 74:47-52.

Relevance

Score: 85

Rating:L

Reliability

Score: 53

Rating: N

*Control not described, Control response not within acceptable guidelines

	Wheelock et al. 2005	<i>C. dubia</i>
Parameter	Value	Comment
Test method cited	USEPA 1993, 2002	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Hyalellidae	
Genus	<i>Hyalella</i>	
Species	<i>azteca</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	48 h	
Source of organisms	Lab cultures	
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	Mortality	
Control response 1	6-13%	
Temperature	23°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	99%	

	Wheelock et al. 2005	<i>C. dubia</i>
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	% NR, methanol	
Concentration 1 Nom/Meas (µg/L)	0	3 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	0.025	3 reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	0.050	3 reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	0.075	3 reps, 5/rep
Control	Not described	3 reps, 5/rep
LC ₅₀ (95% confidence interval) (µg/L)	Time to test initiation (min) 15: 0.0395 (0.0342-0.0456) 30: 0.0354 (0.0278-0.0449) 60: 0.0354 (0.0328-0.0381) 120: 0.0375 (0.0293-0.0480) 240: 0.0477 (0.0411-0.0554)	Method: Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Analytical method (4), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -42

Acceptability (Table 3.8): Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), 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), Hypothesis tests (3). -52

Toxicity Data Summary

Hexagenia bilineata

Study: **23648**. Forbis A, McAllister W. 1980. Dynamic acute toxicity of 14C-permethrin to mayfly nymphs (*Hexagenia bilineata*) in a flow-through diluter system. Analytical Bio-Chemistry Laboratories Rept. #23648. Doc No. C824.

Location: caitlin1.pdf pg 144-145

Relevance

Score: 75

Rating: L

Reliability

Score: 26.7

Rating: N

Acceptable method (10), Control (15)

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Ephemeridae	
Genus	<i>Hexagenia</i>	
Species	<i>bilineata</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
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	96 hr	
Data for multiple times?	NR	
Mortality		
Control response	NR	
Effect 2		
Temperature	NR	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	NR	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)		Reps and # per (cell density for single-celled organisms):
Concentration 2 Nom/Meas (µg/L)	.021	
Concentration 3 Nom/Meas (µg/L)	.045	
Concentration 4 Nom/Meas (µg/L)	.097	
Concentration 5 Nom/Meas (µg/L)	.190	
Concentration 6 Nom/Meas (µg/L)	.470	
Control	NR	
LC50	Day 1 470 ng/L 2 330 ng/L 3 160 ng/L 4 100 ng/L	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism source (5), Organism age (5), Chemical purity (5), Analytical method (4), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), 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), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Hexagenia rigida

Study: Friesen MK, Galloway TD, Flannagan JF. 1983. Toxicity of the insecticide permethrin in water and sediment to nymphs of the burrowing mayfly *Hexagenia rigida* (Ephemeroptera: Ephemeridae). Can Ent 115:1007-1014.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, No toxicity value calculable, Controls not described

Toxicity Data Summary

Helisoma trivolvis

Study: Spehar RL, Tanner DK, Nordling BR. 1983. Toxicity of the synthetic pyrethroids, permethrin and AC 222,705 and their accumulation in early life stages of fathead minnows and snails. *Aquatic Toxicology* 3:171-182.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, toxicity values not calculable, control response not reported

Toxicity Data Summary

Ictalurus punctatus

Study: Coulon DP. 1982. Toxicity of Ambush and Pydrin to red crawfish, *Procambarus clarkii* (Girard) and channel catfish, *Ictalurus punctatus* Rafinesque in laboratory and field studies and the accumulation and dissipation of associated residues. Ph.D. Thesis, Louisiana State University, Baton Rouge, LA.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls not described, response not reported

Toxicity Data Summary

Various insects: *Simulium vitatum*, *Hydrpsych* & *Chematapsychee* spp., *Stenacron* spp., *Ishnura* & *Enallagma* spp., *Hydrophilus* spp.

Tang J.-X.; Siegfried B. D. Comparative uptake of a pyrethroid and organophosphate insecticide by selected aquatic insects. *Bull. Environ. Contam. Toxicol.* **1995**, 55, 130-135.

Relevance

Score: 75

Rating: L

Reliability

Score: 44.9

Rating: N

Relevance Points taken off for: Standard method (10), Controls (15).

Reference	Tang & Siegfried, 1995	Various Insects
Parameter	Value	Comment
Test method cited	NR	
Phylum		
Class		
Order		
Family		
Genus		
Species		
Family in North America?	Yes	
Age/size at start of test/growth phase	Larva-adult	
Source of organisms	NR	“Nebraska”
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 hr	
Data for multiple times?	Yes	3, 6, 12, 24 hr
Effect 1	Immobility	
Control response 1	NR	
Temperature	20°C	
Test type	Static	
Photoperiod/light intensity	In dark	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Reference	Tang & Siegfried, 1995	Various Insects
Parameter	Value	Comment
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	96%	
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration Nom/Meas ($\mu\text{g/L}$)	NR	8 or 4 Reps and "5 or 10" organisms per rep (n=40)
Control	NR	
LC50; $\mu\text{g/L}$	Black fly 4.5 Caddisfly 5.9 Mayfly 2.9 Damselfly 45* Scavaging Diving Beetle 4.4	NR *Exceeds solubility of permethrin

Reliability points taken off for:

Documentation: Control type (8), Organism source (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical methods (5), Hypothesis tests (8).

Acceptability: No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms/rep (2), Organism acclimation (1), Exposure type (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature not held (3), Conductivity (1), pH (2), Number of concentrations (3), Random design (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Lymnaea acuminata

Study: Singh DK, Agarwal RA. 1986. Piperonyl butoxide synergism with two synthetic pyrethroids against *Lymnaea acuminata*. Chemosphere 15:493-498.

Relevance

Score: n/a

Rating:N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested exceeded 2x the aqueous solubility of permethrin.

Toxicity Data Summary

Lepomis macrochirus, Ictalurus punctatus

Exposure of fish to ^{14}C -FMC-33297: Accumulation, distribution and elimination of ^{14}C residues.
EG&G Bionomics, 1976.

Location: "caitlin1.pdf" pg 53-82

Relevance

Score: 45

Rating: N

Reliability

Score:

Rating:

No acceptable method (10), Endpoint (15), Toxicity value (15), Control (15).

Toxicity Data Summary

Lepomis macrochirus

Study: Adams DS. 1980. Phase 3 summary of MRID 00110705. Permethrin (PP557):
Determination of the acute toxicity of JFU 5054 a 24% w/w formulation to bluegill sunfish
(*Lepomis macrochirus*). Report no. BL/B/1832 Study number: FT/1/77/C. Study performed by
ICI Brixham Laboratory Freshwater Quarry: Brixham, Devon, UK. EPA MRID 42277001.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All toxicity values (20.5-26.8 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Lepomis macrochirus

Study: Hill RW, Maddock BG, Hart B, Bowles PF. 1976. Determination of the acute toxicity of PP 557 to bluegill sunfish (*Lepomis macrochirus*). Imperial Chemical Industries Limited, Brixham Laboratory. Report BL/B/1701. CDPR ID: study number 15148.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

Relevance Points taken off for: Standard method (10), Chemical purity NR (15), Controls (15).

Toxicity Data Summary

Lepomis macrochirus

Study: USEPA. 1978. Biological report of analysis. TN 2343.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All reported LC50s (13.3-32 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Lepomis macrochirus

Study: USEPA. 1978b. Biological report of analysis. TN 1127.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All reported LC50s (13.5-19.0 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Loligo pealei

Two different types of inhibitory effect of pyrethroids on Nerves Ca- and Ca+ Mg-ATPase activity in the squid, *Loligo pealei*. J Marshall Clark and F. Matsumura. 1982. Pesticide Biochemistry and Physiology, **18**, 180-190.

Relevance

Score: 30

Rating: N

Reliability

Score:

Rating:

No standard method (10), Endpoint linked to survival (15), Freshwater (15), Toxicity values (15), Control (15)

Toxicity Data Summary

Lampsilis siliquoidea

Study: Bringolf RB, Cope WG, Barnhart MC, Mosher S, Lazaro PR, Shea D. 2007b. Acute and chronic toxicity of pesticide formulations (atrazine, chlorpyrifos, and permethrin) to glochidia and juveniles of *Lampsilis siliquoidea*. Environ Toxicol Chem 26:2101-2107.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*all concentrations tested and EC50 values exceed 2x aqueous solubility

Toxicity Data Summary

Litopenaeus stylirostris

Study: Reyes JGG, Leyva NR, Millan OA, Lazcano GA. 2002. Effects of pesticides on DNA and protein of shrimp larvae *Litopenaeus stylirostris* of the California Gulf. *Ecotoxicology and Environmental Safety* 53:191-195.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The reported LC50 of 291.7 ug/L exceeds 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Lepomis macrochirus

Hill RW, Maddock BG, Hart B, Cornish SK. 1977. "Determination of the acute toxicity of formulation JFU 5054 to bluegill sunfish (*Lepomis macrochirus*)". Imperial Chemical Industries Limited, Brixham Laboratory.

Relevance
Score: 75
Rating: L

Reliability
Score: 68.4
Rating: L

Relevance Points taken off for: Standard method (10), Chemical purity (15).

Reference	Hill et al, 1977	<i>L.macrochirus</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Centrarchidae	
Genus	<i>Lepomis</i>	
Species	<i>macrochirus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Avg weight and length: 1.68 g, 44 mm	
Source of organisms	Sutchland Laboratory Animals Inc, Denver, Pennsylvania	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	NR	
Temperature	23 +/- 0.5°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Reservoir	
pH	7.40 – 7.55	

Reference	Hill et al, 1977	<i>L.macrochirus</i>																				
Parameter	Value	Comment																				
Hardness	45-51 mg/L CaCO ₃																					
Alkalinity	NR																					
Conductivity	NR																					
Dissolved Oxygen	96-100%																					
Feeding	Not fed																					
Purity of test substance	24%																					
Concentrations measured?	Yes																					
Measured is what % of nominal?	50-126%																					
Chemical method documented?	Yes																					
Concentration of carrier (if any) in test solutions	NR																					
Concentration 1 Nom/Meas (mg/L)	<table border="1"> <thead> <tr> <th>Measured</th> <th>Nominal</th> </tr> </thead> <tbody> <tr> <td>0.0033</td> <td>0.0019</td> </tr> <tr> <td>0.0047</td> <td>0.0031</td> </tr> <tr> <td>0.0068</td> <td>0.0056</td> </tr> <tr> <td>0.01</td> <td>0.0062</td> </tr> <tr> <td>0.015</td> <td>0.0075</td> </tr> <tr> <td>0.022</td> <td>0.0131</td> </tr> <tr> <td>0.033</td> <td>0.0210</td> </tr> <tr> <td>0.047</td> <td>0.0595</td> </tr> <tr> <td>Control (0)</td> <td>0</td> </tr> </tbody> </table>	Measured	Nominal	0.0033	0.0019	0.0047	0.0031	0.0068	0.0056	0.01	0.0062	0.015	0.0075	0.022	0.0131	0.033	0.0210	0.047	0.0595	Control (0)	0	10 organisms per rep
Measured	Nominal																					
0.0033	0.0019																					
0.0047	0.0031																					
0.0068	0.0056																					
0.01	0.0062																					
0.015	0.0075																					
0.022	0.0131																					
0.033	0.0210																					
0.047	0.0595																					
Control (0)	0																					
LC50; indicate calculation method	<table border="1"> <thead> <tr> <th>Hr</th> <th>LC50 (mg/L)</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>0.021</td> </tr> <tr> <td>48</td> <td>0.015</td> </tr> <tr> <td>96</td> <td>0.0108</td> </tr> </tbody> </table>	Hr	LC50 (mg/L)	24	0.021	48	0.015	96	0.0108	Geometric mean survival period LC50s exceed water solubility of permethrin												
Hr	LC50 (mg/L)																					
24	0.021																					
48	0.015																					
96	0.0108																					

Reliability points taken off for:

Documentation: Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8).

Acceptability: No standard method (5), Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Exposure type (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Lepomis macrochirus

42584004. Sankey SA, Morris DS, Caunter JE, Stanley RD. 1992. Permethrin: acute toxicity to bluegill sunfish (*Lepomis macrochirus*) of a 10% EC formulation. Brixham Environmental Laboratory, Brixham, UK, Rept No BL4570/B. Doc No. C818.

Relevance

Score:

Rating: N

Reliability

Score:

Rating:

LC50s exceed the water solubility of permethrin (5.5-6 µg/L)

<u>Hr</u>	<u>LC50 (µg/L)</u>
24	110
48	34
72	24
96	24

Toxicity Data Summary

Menippe mercenaria

Study: Borthwick PW, Walsh GE. 1981. Initial toxicological assessment of Ambush ®, Bolero ®, Bux ®, Dursban ®, Fentrifanil ®, Larvin ®, and Pydrin ®: Static acute toxicity tests with selected estuarine algae, invertebrates, and fish. EPA-600/4-81-076. Environmental Research Laboratory, U.S. EPA, Gulf Breeze, FL.

Relevance
Score: 70
Rating: L

Reliability
Score: 52.5
Rating: N

*Saltwater, Controls not mentioned

	Borthwick et al. 1981	<i>M. mercenaria</i>
Parameter	Value	Comment
Test method cited	ASTM 1978	
Phylum		
Class		
Order		
Family		
Genus	<i>Menippe</i>	
Species	<i>mercenaria</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Zoea larvae	
Source of organisms	Hatched from gravid females collected in field	Santa Rosa Sound, Sabine Island
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	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	20 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Borthwick et al. 1981	<i>M. mercenaria</i>
Parameter	Value	Comment
Feeding	During test to minimize cannibalism/starvation	Fed 48 h old <i>Artemia nauplii</i>
Purity of test substance	93%	
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	Reps and # per: NR
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)	NR	
Concentration 6 Nom/Meas (µg/L)	NR	
Control	NR	
LC ₅₀ (95% confidence interval) (µg/L)	96 h: 0.018 (0.010-0.032)	Method: either probit, binomial, or moving average

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8).

Acceptability (Table 3.8): 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), 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

Mesocyclops sp.

Study: Manonmani AM, Vasuki V, Balaraman K. 1989. Establishment of a standard test method for determining susceptibility of *Mesocyclops* to different insecticides. Indian J Med Res 89:43-47.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Control response not reported.

Toxicity Data Summary

Notonecta indica L.

Study: Alexander TC, Meisch MV, Kottkamp WB, Anderson AL. 1982. Effect of notonectids on mosquito larvae and preliminary observations of insecticide toxicity. Arkansas Farm Research 31:5.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls and response not described.

Toxicity Data Summary

Oreochromis aureus

Study: Herzberg AM. 1988. Toxicity and accumulation of permethrin in the tilapia *Oreochromis aureus*. Israel Journal of Aquaculture 40:35-39.

Relevance

Score: 70

Rating: L

Reliability

Score: 44

Rating: N

*Chemical purity not reported, controls not described, response not reported

	Herzberg 1988	<i>O. aureus</i>
Parameter	Value	Comment
Test method cited	ASTM 1980	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Cichlidae	
Genus	<i>Oreochromis</i>	
Species	<i>aureus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	10.5 g average weight	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	24 °C	
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	NR	
Concentrations measured?	Yes	

	Herzberg 1988	<i>O. aureus</i>
Parameter	Value	Comment
Measured is what % of nominal?	8-47%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Meas (µg/L)	Test 1: 4.19 Test 2: 4.20	2 tests, 10/rep
Concentration 2 Meas (µg/L)	Test 1: 7.34 Test 2: 4.83	2 tests, 10/rep
Concentration 3 Meas (µg/L)	Test 1: 9.10 Test 2: 6.57	2 tests, 10/rep
Concentration 4 Meas (µg/L)	Test 1: 11.8 Test 2: 6.95	2 tests, 10/rep
Concentration 5 Meas (µg/L)	Test 1: 10.5 Test 2: 8.31	2 tests, 10/rep
Concentration 6 Meas (µg/L)	Test 2: 10.5	10/rep
Control	NR	
LC50 (95% confidence limits) (µg/L)	Test 1: 6.23 (5.57-6.97) Test 2: 6.54 (5.95-7.00)	Method: trimmed Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Chemical purity (5), Nominal concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -43

Acceptability (Table 3.8): Control description (6), Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -69

Toxicity Data Summary

Orconectes immunis

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, toxicity value not calculable, control description

Toxicity Data Summary

Oryzias latipes

Study: Gonzalez-Doncel M, de la Pena E, Barrueco C, Hinton DE. 2003. Stage sensitivity of medaka (*Oryzias latipes*) eggs and embryos to permethrin. *Aquatic Toxicology* 62:255-268.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested exceeded 2x the aqueous solubility

Toxicity Data Summary

Oryzias latipes

Study: Kikuchi T, Nagashima Y, Chiba M. 1984. Accumulation and excretion of permethrin by the Himedaka *Oryzias latipes* and biological significance of accumulated permethrin. Bulletin of the Japanese Society of Scientific Fisheries 50:101-106.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Tested cis-permethrin and trans-permethrin, not the mixture; all LC50s > 2x aqueous solubility

Toxicity Data Summary

Oreochromis mossambicus

Study: Shafiei TM, Costa HH. 1990. The susceptibility and resistance of fry and fingerlings of *Oreochromis mossambicus* Peters to some pesticides commonly used in Sri Lanka. J Appl Ichthyol 6:73-80.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Control response not reported.

Toxicity Data Summary

Oncorhynchus mykiss (formerly *Salmo gairdneri*)

Study: Coats JR, O'Donnell-Jeffery NL. 1979. Toxicity of four synthetic pyrethroid insecticides to rainbow trout. Bull Environ Contam Toxicol 23:250-255.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 135 ug/L > 2x aqueous solubility (5.5 ug/L)

Notes: They measured the aqueous solubility in this study and report it to be 40 ug/L. The LC50 is still more than 2x their reported solubility.

Toxicity Data Summary

Oncorhynchus mykiss

Study: Glickman AH, Hamid AAR, Rickert DE, Lech JJ. 1981. Elimination and metabolism of permethrin isomers in rainbow trout. *Toxicol Appl Pharmacol* 57:88-98.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 18 ug/L exceeds 2x the aqueous solubility (5.5 ug/L)

Toxicity Data Summary

Oncorhynchus mykiss

Study: Glickman AH, Weitman SD, Lech JJ. 1982. Differential toxicity of trans-permethrin in rainbow trout and mice. I. Role of biotransformation. Toxicol Appl Pharmacol 66:153-161.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 18 ug/L exceeds 2x aqueous solubility (5.5 ug/L)

Toxicity Data Summary

Oncorhynchus mykiss (formerly *Salmo gairdneri*)

Study: Kumaraguru AK, Beamish FWH. 1981. Lethal toxicity of permethrin (NRDC-143) to rainbow trout, *Salmo gairdneri*, in relation to body weight and water temperature. Water Research 15:503-505.

Relevance

Score: 75

Rating: L

Reliability

Score: 52.5

Rating: N

*Unacceptable standard method, controls not described, response not reported.

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Test method cited	Similar to Sprague (1969)	
Phylum		
Class		
Order		
Family		
Genus	<i>Oncorhynchus</i>	
Species	<i>mykiss</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	1) mean 0.89 g (0.8-1.2 g) 2) mean 5.1 g (4.6-5.4 g) 3) mean 19.3 g (18-23 g) 4) mean 48.2 g (47-53 g) 5) mean 202.1 g (196-205)	
Source of organisms	Commercial supplier	Goosen's Trout Farm, Otterville, Ontario
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 on graph	
Effect 1	Mortality	
Control response 1	NR	
Temperature	1) 5, 10, 15, 20 °C 2) 15 °C 3) 15 °C 4) 15 °C 5) 15 °C	

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	NR for test, acclimation was in non-chlorinated well water	
pH	NR for test, acclimation was at 7.9-8.2	
Hardness	NR for test, acclimation had 358-363 mg/L (EDTA)	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	86.6%	
Concentrations measured?	Yes	
Measured is what % of nominal?	84-95%	
Toxicity values calculated based on nominal or measured concentrations?	Not clear	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	<0.001% ethanol	
Concentration 1 Nom (µg/L)	1) 5°C: 0.1 10°C: 0.1 15°C: 0.5 20°C: 2 2) 15°C: 0.1 3) 15°C: 200* 4) 15°C: 200* 5) 15°C: 200*	10/rep
Concentration 2 Nom (µg/L)	1) 5°C: NR 10°C: NR 15°C: NR 20°C: NR 2) 15°C: NR 3) 15°C: NR 4) 15°C: NR 5) 15°C: NR	10/rep
Concentration 3 Nom (µg/L)	1) 5°C: NR 10°C: NR 15°C: NR 20°C: NR 2) 15°C: NR 3) 15°C: NR 4) 15°C: NR 5) 15°C: NR	10/rep

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Concentration 4 Nom (µg/L)	1) 5°C: NR 10°C: NR 15°C: NR 20°C: NR 2) 15°C: NR 3) 15°C: NR 4) 15°C: NR 5) 15°C: NR	10/rep
Concentration 5 Nom (µg/L)	1) 5°C: NR 10°C: NR 15°C: NR 20°C: NR 2) 15°C: NR 3) 15°C: NR 4) 15°C: NR 5) 15°C: NR	10/rep
Concentration 6 Nom (µg/L)	1) 5°C: NR 10°C: NR 15°C: NR 20°C: 32 2) 15°C: 20* 3) 15°C: 500* 4) 15°C: 500* 5) 15°C: 500*	10/rep
Concentration 7 Nom (µg/L)	1) 5°C: 2.5 10°C: 2.5 15°C: 8.0	10/rep
Control	Not described	10/rep
LC ₅₀ (95% confidence interval) (µg/L)	1) 5°C: 96h: 0.62 (0.49-0.97) 10°C: 96h: 0.69 (0.60-1.22) 15°C: 96h: 3.17 (2.79-5.78) 20°C: 96h: 6.43 (4.91-8.07) 2) 15°C: 96h: 6.43 4) 15°C: 96h: 287 (211-391)* 5) 15°C: 96h: 314 (218-454)*	Method: probit

Notes: Additional LC50s are displayed in Figure 1A and 1B, but they would be approximations from the graph so they are not reported here.

*indicates concentration > 2x aqueous solubility of permethrin (5.5 ug/L)

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -41

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -54

Toxicity Data Summary

Oncorhynchus mykiss

Study: Marking LL, Bills TD, Crowther JR. 1984. Effects of five diets on sensitivity of rainbow trout to eleven chemicals. *Progressive Fish-Culturist* 46:1-5.

Relevance

Score: 70

Rating: L

Reliability

Score: 39.5

Rating: N

*Chemical purity not reported, Controls not described, response not reported

	Marking et al. 1984	<i>O. mykiss</i>
Parameter	Value	Comment
Test method cited	ASTM 1980	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Oncorhynchus</i>	
Species	<i>mykiss</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Average weight 1 g	
Source of organisms	Lab cultures	
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	Mortality	
Control response 1	NR	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	NR	
Concentrations measured?	No	

	Marking et al. 1984	<i>O. mykiss</i>
Parameter	Value	Comment
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	5 tests, 10/rep
Concentration 2 Nom/Meas (µg/L)		
Concentration 3 Nom/Meas (µg/L)		
Concentration 4 Nom/Meas (µg/L)		
Concentration 5 Nom/Meas (µg/L)		
Concentration 6 Nom/Meas (µg/L)		
Control	NR	
LC ₅₀ (95% confidence interval) (µg/L)	Test 1: 6.00 (5.24-6.36) Test 2: 4.54 (3.73-5.52) Test 3: 6.09 (5.40-6.87) Test 4: 5.15 (4.27-6.21) Test 5: 4.50 (3.84-5.27)	Method: Litchfield & Wilcoxon

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -51

Acceptability (Table 3.8): Control description (6), Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -70

Toxicity Data Summary

Oncorhynchus mykiss

42584003. Sankey SA, Morris DS, Caunter JE, Stanley RD. 1992. Permethrin: acute toxicity to rainbow trout (*Oncorhynchus mykiss*) of a 10% EC formulation. Brixham Environmental Laboratory, Brixham, UK, Rept No BL4529/B. Doc No. C813.

Relevance

Score:

Rating: N

Reliability

Score:

Rating:

LC50s exceed water solubility of permethrin (5.5-6 µg/L).

<u>Hr</u>	<u>LC50 (µg/L)</u>
24	>130
48	>130
72	77
96	73

Toxicity Data Summary

Oreochromis niloticus
Tilapia zillii

Study: Yameogo L, Traore K, Back C, Hougard J-M, Calamari D. 2001. Risk assessment of etofenprox (Vectron ®) on non-target aquatic fauna compared with other pesticides used as *Simulium* larvicides in a tropical environment. Chemosphere 42:965-974.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values (27-75 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Oncorhynchus kisutch

Study: EG&G Bionomics. 1976. "Acute toxicity of PP557 technical to Coho Salmon (*Oncorhynchus kisutch*)".

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

LC50s exceed 2x water solubility of permethrin.

Toxicity Data Summary

Oncorhynchus mykiss

Kent SJ, Morris DS, Caunter JE & Johnson PA. (1995). "Permethrin: Acute toxicity to rainbow trout (*Oncorhynchus mykiss*) of a 25% formulation". Brixham Environmental Laboratory.

This study is rated N because the LC50's based on the active ingredient (permethrin) calculated exceed the water solubility of permethrin.

Toxicity Data Summary

Procambarus clarkii

Study: Coulon DP. 1982. Toxicity of Ambush and Pydrin to red crawfish, *Procambarus clarkii* (Girard) and channel catfish, *Ictalurus punctatus* Rafinesque in laboratory and field studies and the accumulation and dissipation of associated residues. Ph.D. Thesis, Louisiana State University, Baton Rouge, LA.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls not described, response not reported

Toxicity Data Summary

Procambarus clarkii

Study: Jolly AL, Avault JW, Graves JB, Koonce KL. 1977. Effects of Pounce® on newly hatched and juvenile Louisiana red swamp crayfish, *Procambarus clarkii* (Girard). Freshwater Crayfish 3:389-395.

Relevance

Score: Acute: 60, Chronic: 45

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Toxicity value not calculable (chronic only), Controls not described, responses not acceptable/reported

Toxicity Data Summary

Pollimyrus isidori

Study: Yameogo L, Tapsoba J-M, Calamari D. 1991. Laboratory toxicity of potential blackfly larvicides on some African fish species in the onchocerciasis control programme area. *Ecotoxicology and Environmental Safety* 21:248-256.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values (26-40 ug/L) exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Ptychocheilus lucius

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 > 2x aqueous solubility

Toxicity Data Summary

Ptychocheilus lucius

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 24 ug/L exceeds 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Pimephales promelas

Study: Geiger DL, Call DJ, Brooke LT 1988. Acute toxicities of organic chemicals to fathead minnows (*Pimephales promelas*), Volume IV. Center for Lake Superior Environmental Studies, University of Wisconsin-Superior: Superior, WI.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Reported LC50 (16.0 ug/L) exceeds 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Palaemonetes pugio

Study: DeLorenzo ME, Serrano L, Chung KW, Hoguet J, Key PB. 2006. Effects of the insecticide permethrin on three life stages of the grass shrimp, *Palaemonetes pugio*. Ecotoxicol Environ Safety 64:122-127.

Relevance

Score: Acute: 52.5, Chronic: 60

Rating: Acute: N, Chronic: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Chemical purity not reported, Control response not reported (acute only)

Toxicity Data Summary

Palaemonetes pugio

Study: Marshalonis D, Knowlton RE, Merchant H. 2006. Acute toxicity of permethrin to four populations of ovigerous grass shrimp, *Palaemonetes pugio* Holthuis. Bull Environ Contam Toxicol 77:543-550.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Chemical purity not reported, Control response not reported.

Toxicity Data Summary

Poecilia reticulata

Study: Baser S, Erkoc F, Selvi M, Kocak O. 2003. Investigation of acute toxicity of permethrin on guppies *Poecilia reticulata*. Chemosphere 51:469-474.

Relevance

Score: 100

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 245.7 ug/L is > 2x the aqueous solubility (5.5 ug/L)

Toxicity Data Summary

Pimpehales promelas

Hill RW, Maddock BG, Hart B & Gilbert JL. (1976). Determination of the acute toxicity of PP 557 to Fathead Minnows (*Pimpehales promelas*).

Relevance

Score: 75

Rating: L

Reliability

Score: 58.8

Rating: N

Relevance Points taken off for: Standard Method (15), Controls (15).

Reference	EG&G, 1976	<i>P. promelas</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Pimperhales</i>	
Species	<i>Promelas</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Avg weight: 1.60 g Avg length: 50.44 mm	
Source of organisms	Dutchland Laboratory Animals Inc, Denver Pennsylvania	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hour	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Temperature	23±0.5°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	reservoir	
pH	7.80-7.95	
Hardness	41.0-48.0 mg/L CaCO ₃	
Alkalinity	NR	
Conductivity	NR	

Reference	EG&G, 1976	<i>P. promelas</i>
Parameter	Value	Comment
Dissolved Oxygen	94% or higher	
Feeding	NR	
Purity of test substance	NR	
Concentrations measured?	Yes	
Measured is what % of nominal?	38-120%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	1 mg/L DMSO	
Concentration 1 Nom/Meas (mg/L)	0.68 / 0.26	1 Reps and 10 organisms per rep
Concentration 2 Nom/Meas (mg/L)	0.33 / 0.17	“
Concentration 3 Nom/Meas (mg/L)	0.10 / 0.0572	“
Concentration 4 Nom/Meas (mg/L)	0.068 / 0.038, 0.031	“
Concentration 5 Nom/Meas (mg/L)	0.033 / 0.0436, 0.0126	“
Concentration 6 Nom/Meas (mg/L)	0.010 / 0.0060, 0.0092, 0.0116	“
Concentration 7 Nom/Meas (mg/L)	0.0068 / 0.00480, 0.00672, 0.00454, 0.00630	“
Concentration 8 Nom/Meas (mg/L)	0.0033 / 0.00780, 0.00256, 0.00284, 0.00320	“
Concentration 9 Nom/Meas (mg/L)	0.0015 / 0.00136, 0.00122, 0.00044, 0.00180	“
Control	Not described	1 Reps and 10 per
LC50; mg/L	24 hr 0.015* 48 hr 0.0054 96 hr 0.0020	Concentration correlated with Geometric Mean Survival Periods

*Concentration exceeds water solubility of permethrin (0.006 mg/L)

Reliability points taken off for:

Documentation: Control type (8), Chemical purity (5), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8).

Acceptability: No standard method (5), 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), Feeding (3), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Pimpehales promelas

096699. EG&G Bionomics. 1977. Chronic toxicity of FMC 33297 to the fathead minnow (*Pimpehales promelas*). EG&G Bionomics. Doc No. C850.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 55.9

Rating: N

Acceptable Standard method (10), Toxicity Value Calculable (15), Control Response (7.5)

	Study Name and Year	<i>G. species</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Pimperhales</i>	
Species	<i>Promelas</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
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	3 weeks	
Data for multiple times?	Y	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Organism source (5), Organism age (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Minimum significant difference (2), % control of NOEC/LOEC (2), Point estimates (8).

Acceptability (Table 3.8):

No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations Organism size (3), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Exposure type (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Dilution factor (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Pycnopsyche sp.
Ophiogomphus sp.
Simulium venustum

Study: Poirier DG, Surgeoner GA. 1987. Laboratory flow-through bioassays of four forestry insecticides against stream invertebrates. *The Canadian Entomologist* 119:755-763.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls not described, response not reported.

Toxicity Data Summary

Rana catesbiana

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity value (LC50=115 ug/L) exceeds 2x the aqueous solubility of permethrin (5.5 ug/L)

Toxicity Data Summary

Rana sphenoccephala

Study: Bridges CM, Dwyer FJ, Hardesty DK, Whites DW. 2002. Comparative contaminant toxicity: Are amphibian larvae more sensitive than fish? Bull Environ Contam Toxicol 69:562-569.

Relevance

Score: 85

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 of 18.2 ug/L > 2x aqueous solubility (5.5 ug/L)

Toxicity Data Summary

Rana temporaria

Study: Johansson M, Piha H, Kylin H, Merila J. 2006. Toxicity of six pesticides to common frog (*Rana temporaria*) tadpoles. Environ Toxicol Chem 25:3164-3170.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, chemical purity not reported, no toxicity values, control response not reported

Toxicity Data Summary

Skeletonema costatum

Study: Walsh GE, Alexander SV. 1980. A marine algal bioassay method: Results with pesticides and industrial wastes. *Water, Air, and Pollution* 13:45-55.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Toxicity values exceed 2x aqueous solubility of permethrin

Toxicity Data Summary

Skeletonema costatum

Study: Borthwick PW, Walsh GE. 1981. Initial toxicological assessment of Ambush ®, Bolero ®, Bux ®, Dursban ®, Fentrifanil ®, Larvin ®, and Pydrin ®: Static acute toxicity tests with selected estuarine algae, invertebrates, and fish. EPA-600/4-81-076. Environmental Research Laboratory, U.S. EPA, Gulf Breeze, FL.

Relevance

Score: 77.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Saltwater, Control response not reported
EC50 values > 2x aqueous solubility

Toxicity Data Summary

Salmo salar

Study: McLeese DW, Metcalfe CD, Zitko V. 1980. Lethality of permethrin, cypermethrin and fenvalerate to salmon, lobster and shrimp. Bull Environ Contam Toxicol 25:950-955.

Relevance

Score: 75

Rating: L

Reliability

Score: 40

Rating: N

*No standard method, Controls not mentioned,

	McLeese et al. 1980	<i>S. salar</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	<i>Salmo</i>	
Species	<i>salar</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean length 6.2 cm, mean wt 5.3 g	
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	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	10 °C	
Test type	Static renewal (48 h)	
Photoperiod/light intensity	NR	
Dilution water	NR	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	92.1%	

	McLeese et al. 1980	<i>S. salar</i>
Parameter	Value	Comment
Concentrations measured?	Yes	
Measured is what % of nominal?	74%	
Toxicity values calculated based on nominal or measured concentrations?	Not reported, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	% NR, ethanol	
Concentration 1 Nom/Meas (µg/L)	6 concentrations	3/rep
Concentration 2 Nom/Meas (µg/L)	NR	3/rep
Concentration 3 Nom/Meas (µg/L)	NR	3/rep
Concentration 4 Nom/Meas (µg/L)	NR	3/rep
Concentration 5 Nom/Meas (µg/L)	NR	3/rep
Concentration 6 Nom/Meas (µg/L)	NR	3/rep
Control	Not described	3/rep
LC ₅₀ (µg/L)	12	Method: geometric mean of concentrations bracketing 50% mortality

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism source (5), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -46

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Organism acclimation (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3). -74

Toxicity Data Summary

Salmo salar

Study: Zitko V, Carson WG, Metcalfe CD. 1977. Toxicity of pyrethroids to juvenile Atlantic salmon. Bull Environ Contam Toxicol 18:35-41.

Relevance

Score: 75

Rating: L

Reliability

Score: 38

Rating: N

*No standard method, Controls not described, Control response not reported

	Zitko et al. 1977	<i>S. salar</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Salmo</i>	
Species	<i>salar</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles, mean length 10.0 cm, mean wt 11.07 g	
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	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	10°C	
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	92.1%	

	Zitko et al. 1977	<i>S. salar</i>
Parameter	Value	Comment
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC/MS	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	NR	3/rep
Concentration 2 Nom/Meas (µg/L)		Reps and # per
Concentration 3 Nom/Meas (µg/L)		Reps and # per
Concentration 4 Nom/Meas (µg/L)		Reps and # per
Concentration 5 Nom/Meas (µg/L)		Reps and # per
Concentration 6 Nom/Meas (µg/L)		Reps and # per
Control	NR	Reps and # per
LC ₅₀ (µg/L)	8.8	Method: NR

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism source (5), 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). -51

Acceptability (Table 3.8): No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Organism acclimation (1), 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). -73

Toxicity Data Summary

Simulium squamosum

Study: Hougard J-M, Escaffre H, Darriet F, Lochouarn L, Riviere F, Back C. 1992. An episode of resistance to permethrin in larvae of *Simulium squamosum* (Diptera: Simuliidae) from Cameroon, after 3½ years of control. Journal of the American Mosquito Control Association 8:184-186

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Control response not reported.

Toxicity Data Summary

Salmo gairdnerii

ESG-1. Hill RW, Maddock BG, Hart B. 1976. PP557: determination of the acute toxicity of PP557 to rainbow trout (*Salmo gairdneri*). Brixham Environmental Laboratory, Brixham, UK, Report No BL/B/1700. Doc No. C801.

Location: caitlin3.pdf p.29-49

Relevance

Score: 75

Rating: L

Reliability

Score: 55.6

Rating: N

Standard method (10), Controls (15).

Reference	Hill et al., 1976	<i>Salmo gairdnerii</i>
Parameter	Value	Comment
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Salmo</i>	
Species	<i>gairdnerii</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.305 g 26 mm	
Source of organisms	Samaki Trout Farm, Wiltshire	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	NR	
Temperature	13 +/- 0.5°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	“20,000 gallon reservoir”	
pH	~7.8	
Hardness	24.5-31 mg/L	
Alkalinity	NR	

Reference	Hill et al., 1976	<i>Salmo gairdnerii</i>
Parameter	Value	Comment
Conductivity	NR	
Dissolved Oxygen	At least 96% saturation	
Feeding	None	
Purity of test substance	NR	
Concentrations measured?	Yes	
Measured is what % of nominal?	42.8-91.1%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	50 mg/L, 10 mg/L	
Concentration 1 Nom/Meas (µg/L)	0.33 / ND	1 Reps and 10 organisms per rep
Concentration 2 Nom/Meas (µg/L)	0.47 / ND, 0.28, ND	1 Reps and 10 organisms per rep
Concentration 3 Nom/Meas (µg/L)	0.68 / ND, 0.20, ND	1 Reps and 10 organisms per rep
Concentration 4 Nom/Meas (µg/L)	1.0 / 0.58, ND, ND	1 Reps and 10 organisms per rep
Concentration 5 Nom/Meas (µg/L)	2.2 / 0.46/ND	1 Reps and 10 organisms per rep
Concentration 6 Nom/Meas (µg/L)	4.7 / 0.51, 0.64	1 Reps and 10 organisms per rep
Concentration 7 Nom/Meas (µg/L)	10 / 4.8	1 Reps and 10 organisms per rep
Control	NR	
LC50; indicate calculation method	Time 24 hr 0.0125 mg/L 48 hr 0.0054 mg/L 96 hr 0.0025 mg/L	“geometric median survival periods”

Reliability points taken off for:

Documentation: Control type (8), Chemical purity (5), Hardness (2), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).

Acceptability: No standard method (5), Appropriate duration (2), Control description (6), Control response (9), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Salmo gairdnerii

Hill RW, Maddock BG, Hart B & Bowles, PF. (1977). JFU 5054: Determination of the Acute Toxicity of formulation JFU 5054 to Rainbow Trout (*Salmo gairdnerii*). Brixham Laboratory.

Relevance

Score: 60

Rating: N

Reliability

Score:

Rating:

Relevance Points taken off for: Standard method (10), Chemical purity (15), Controls (15)

Toxicity Data Summary

Tanytarsus dissimilis

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, toxicity value not calculable, control description

Toxicity Data Summary

Ambystoma maculatum

Bufo americanus

Rana clamitans

Rana pipiens

Rana sylvatica

Study: Berrill M, Bertram S, Wilson A, Louis S, Brigham D, Stromberg C. 1993. Lethal and sublethal impacts of pyrethroid insecticides on amphibian embryos and tadpoles. Environ Toxicol Chem 12:525-539.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All test concentrations were > 2x aqueous solubility.

Simulium vitattum, - Blackfly
Hydropsyche spp., & *Cheumatopsyche* spp., - Caddisfly
Heptageniidae spp.- Mayfly
Enallagma spp., & *Ishnura* spp.,- Damselfly
Hydrophilus spp., -Water scavenger beetle

Toxicity Data Summary

Siegfried BD. 1993. Comparative toxicity of pyrethroid insecticides to terrestrial and aquatic insects. *Environmental Toxicology and Chemistry* 12: 1683-1689.

AQUATIC exposures only, TOPICAL exposures not summarized here

Relevance

Score: 90 (no std method)

Rating: R

Reliability

Score: 59.3

Rating: N

Parameter	Value	Comment
Test method cited	No standard method cited	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera, Trichoptera, Ephemeroptera, Odonata, Coleoptera	
Family	various	
Genus	<i>Simulium</i> , <i>Hydropsyche</i> , <i>Ishnura</i> , <i>Enallagma</i> , <i>Hydrophilus</i> , <i>Cheumatopsyche</i> , <i>Heptageniidae</i>	Terrestrial insects tested in this study were not included here.
Species	<i>vitattum</i> , others unidentified	
Native to	Nebraska, USA	
Age/size at start of test/growth phase	Larva (Black fly & Caddisfly), nymph (Mayfly & Damselfly), adult (beetles)	
Source of organisms	Collected from field, Lancaster County, NE	Various ponds and lakes
Have organisms been exposed to contaminants?	Yes-probably	Collected from environment
Animals acclimated and disease-free?	Acclimated-72 h	Health status not determined
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 hours	

Parameter	Value	Comment
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 10 mortality, except black flies 14%, mayflies 16%	
Temperature	20 °C	
Test type	Acute Static	
Photoperiod/light intensity	24 hr dark	
Dilution water	states only 'distilled'	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	96%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	states diluted in water	
Concentrations	NR, at least three concentrations used	3 reps, 5-10 insects per rep
Control	acetone	
LC50 ug/L	Black fly 4.5 ug/L Caddisfly 5.9 ug/L Mayfly 4.4 ug/L Damselfly 2.9 ug/L Diving beetle 45 ug/L	probit

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), Hypothesis tests (8)

Acceptability: Acceptable standard method (5), Measured concentrations within 20% Nom (4), Carrier solvent (4) Organism size (3), Prior contamination (4), Organisms randomized (1), No prior contaminant exposure (4), Organisms randomly assigned to containers (1), Dilution water source (2), Hardness (2), Alkalinity (2), Dissolved Oxygen (4), Temperature not held to $\pm 1^{\circ}\text{C}$ (3), Conductivity (2), pH (3), Adequate number of concentrations (3), Random or block design (2), Appropriate spacing between concentrations (2), Hypothesis tests (3)

Toxicity Data Summary

Various

Procambarus clarkii

Ictalurus punctatus

Micropterus salmoides

Gambusia affinis

Rana catesbeiana

Study: Jolly AL, Avault JW, Koonce KL, Graves JB. 1978. Acute toxicity of permethrin to several aquatic animals. Trans Am Fish Soc 107:825-827.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Low chemical purity, Controls not described, response not reported