

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

Appendix B2: studies rated RN, LN, N

Toxicity Data Summary

*Aedes aegypti**Culex quinquefasciatus*

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> <i>C. quinquefasciatus</i>
Parameter	Value	Comment
Test method cited	WHO 1963	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	<i>Culex</i>
Species	<i>aegypti</i>	<i>quinquefasciatus</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	

Appendix B2: studies rated RN, LN, N

	Verma & Rahman 1984	<i>A. aegypti</i> <i>C. quinquefasciatus</i>
Parameter	Value	Comment
Feeding	NR	
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	% 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	<i>A. aegypti</i> : 5 <i>C. quinquefasciatus</i> : 1	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

Appendix B2: studies rated RN, LN, N

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

Aedes aegypti

Study: Rodriguez MM, Bisset JA, Fernandez D. 2007. Levels of insecticide resistance and resistance mechanisms in *Aedes aegypti* from some Latin American countries. Journal of the American Mosquito Control Association. 23(4): 420-429.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

This test used beta-cypermethrin, not racemic cypermethrin, so the data cannot be used.

Toxicity Data Summary

Aedes aegypti

Study: Rodriguez MM, Bisset J, Molina de Fernandez D, Lauzan L, Soca A. 2001. Detection of insecticide resistance in *Aedes aegypti* (Diptera: Culicidae) from Cuba and Venezuela. J Med Entomol 38:623-628.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Standard method not acceptable, Chemical purity not reported, Control response not reported.

Toxicity Data Summary

Aedes aegypti

Study: Rodriguez MM, Bisset J, Ruiz M, Soca A. 2002. Cross-resistance to pyrethroid and organophosphorus insecticides induced by selection with temephos in *Aedes aegypti* (Diptera: Culicidae) from Cuba. J. Med. Entomol. 39(6): 882-888.

Relevance

Score: 82.5 (Standard method, No control response)

Rating: L

Reliability

Score: 52.5

Rating: N

Reference	Rodriguez et al. 2002	<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>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae < 24 h	
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	Survival	
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	

Appendix B2: studies rated RN, LN, N

Reference	Rodriguez <i>et al.</i> 2002	<i>A. aegypti</i>
Parameter	Value	Comment
Feeding	No	
Purity of test substance	90.5%	
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	1 mL acetone /100 mL water	
Concentration 1 Nom/Meas (µg/L)	5 concentrations	20/rep x 2
Control	Water and methanol control	20/rep x 2
LC50 (95% Confidence interval) for 4 strains* in µg/L	Rockefeller (susceptible): 1.3 (0.76-1.8) Santiago de Cuba: 9.4 (8.7-10) SAN-F3: 18 (15-21) SAN-F6: 17 (15-20)	Method: Probit

***Rockefeller**: laboratory susceptible strain of Caribbean origin, colonized in the early 1930s, provided by the CDC laboratory in San Juan, Puerto Rico.

Santiago de Cuba: natural population collected from Santiago de Cuba, Cuba in 1998 and bred for 6 generations with for temefos resistance

SAN-F3:

SAN-F6:

Reliability points taken off for:

Documentation: 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: Standard method (5), Control response (9), Meas. Concentrations 20% Nom (4), Concentrations not $\geq 2x$ water solubility (4), Carrier solvent ≤ 0.5 mL/L (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Test vessels randomized (2), Appropriate spacing between concentrations (2), Hypothesis tests (3). -57

Toxicity Data Summary

Aedes aegypti

Study: Rodriguez MM, Bisset JA, de Armas Y, Ramos F. 2005. Pyrethroid insecticide-resistant strain of *Aedes aegypti* from Cuba induced by deltamethrin selection. Journal of the American Mosquito Control Association 21:437-445.

Relevance

Score: 75

Rating: L

Reliability

Score: 44

Rating: N

*No standard method, appropriate controls not used

	Rodriguez 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>	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 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	

Appendix B2: studies rated RN, LN, N

	Rodriguez et al. 2005	<i>A. aegypti</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	90.5%	
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	2 tests, 5 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 tests, 5 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 tests, 5 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 tests, 5 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 tests, 5 reps, 20/rep
Control	Not used	Reps and # per
LC ₅₀ (fiducial limits) (µg/L)	1.29 (0.76-1.8)	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), Random design (2), Dilution factor (2), Hypothesis tests (3). -66

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

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: 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	

Appendix B2: studies rated RN, LN, N

	Ali et al. 1995	<i>A. albopictus</i>
Parameter	Value	Comment
Feeding	Yes, once at beginning of test	
Purity of test substance	92.3%	
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)	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)	2.6 (1.6-4.0)	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), 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

Acartia clausi

Oithona similis

Pseudocalanus elongatus

Temora longicomis

Study: Willis KJ, Ling N. 2004. Toxicity of the aquaculture pesticide cypermethrin to planktonic marine copepods. *Aquaculture Research* 35:263-270.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Control response not acceptable

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 (80-4720 ug/L) exceed 2x the aqueous solubility of cypermethrin (4 ug/L).

Toxicity Data Summary

Artemia salina

Study: Gartenstein S, Quinnell RG, Larkum AWD. 2006. Toxicity effects of diflubenzuron, cypermethrin and diazinon on the development of *Artemia salina* and *Heliocidaris tuberculata*. Australasian Journal of Ecotoxicology 12:83-90.

Relevance

Score: 75

Rating: L

Reliability

Score: 59

Rating: N

*No standard method, saltwater

	Gartenstein et al. 2006	<i>A. salina</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Anostraca	
Family	Artemiidae	
Genus	<i>Artemia</i>	
Species	<i>salina</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Reared in lab	
Have organisms been exposed to contaminants?	NR	
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	0%	
Temperature	± °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Appendix B2: studies rated RN, LN, N

	Gartenstein et al. 2006	<i>A. salina</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	% acetone	
Concentration 1 Nom/Meas (µg/L)	2	4 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	5	4 reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	10	4 reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	20	4 reps, 5/rep
Control	Solvent	4 reps, 5/rep
LC ₂₀ (95% confidence interval) (µg/L)	6.88	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), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Hypothesis tests (3). -47

Toxicity Data Summary

Aedes stimulans

Study: Helson BV, Surgeoner GA. 1986. Efficacy of cypermethrin for the control of mosquito larvae and pupae, and impact on non-target organisms, including fish. Journal of the American Mosquito Control Association 2:269-275.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56.5

Rating: N

*No standard method, unacceptable control response

	Helson & Surgeoner 1986	<i>A. stimulans</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>stimulans</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Collected in field – natural breeding sites near Guelph, Canada	
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	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Appendix B2: studies rated RN, LN, N

	Helson & Surgeoner 1986	<i>A. stimulans</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	92.7%	
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	0.5% acetone	
Concentration 1 Nom/Meas ($\mu\text{g/L}$)	# of concentrations NR	2 tests, 2 reps, 20/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	Solvent and dilution water	2 reps, 20/rep
LC ₅₀ (95% confidence interval) ($\mu\text{g/L}$)	0.400 (0.351-0.456)	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), 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). -53

Appendix B2: studies rated RN, LN, N

Toxicity Data Summary

Amphiporeia virginiana

Gammarus spp.

Gasterosteus aculeatus

Study: Ernst W, Jackman P, Doe K, Page F, Julien G, Mackay K, Sutherland T. 2001.
Dispersion and toxicity to nontarget aquatic organisms of pesticides used to treat sea lice on salmon in net pen enclosures. *Marine Pollution Bulletin* 42:433-444.

Relevance

Score: 45

Rating: N

Reliability

Score: n/a

Rating: n/a

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

Appendix B2: studies rated RN, LN, N

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

Bombina variegata
Rana arvalis

Study: Greulich K, Pflugmacher S. 2004. Uptake and effects on detoxication enzymes of cypermethrin in embryos and tadpoles of amphibians. Arch Environ Contam Toxicol 47:489-495.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

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

Toxicity Data Summary

Clarias batrachus

Study: Begum G. 2005. In vivo biochemical changes in liver and gill of *Clarias batrachus* during cypermethrin exposure and following cessation of exposure. Pesticide Biochemistry and Physiology 82:185-196.

Relevance

Score: 45

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Endpoint not linked survival/growth/reproduction, Chemical purity not reported, Toxicity values not calculable.

Toxicity Data Summary

Cyprinus carpio

Study: David M, Mushigeri SB, Shivakumar R, Philip GH. 2004. Response of *Cyprinus carpio* (Linn) to sublethal concentration of cypermethrin: alteration in protein metabolic profiles. *Chemosphere* 56:347-352.

Relevance

Score: acute: 75, chronic: 60

Rating: acute: L, chronic: N

Reliability

Score: 34

Rating: N

*No standard method, Chronic endpoints not linked to survival/growth/reproduction, controls not described and response not reported.

	David et al. 2004	<i>C. carpio</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Cyprinus</i>	
Species	<i>carpio</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	State fish hatchery, India	
Have organisms been exposed to contaminants?	Not likely	
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	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Appendix B2: studies rated RN, LN, N

	David et al. 2004	<i>C. carpio</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	96%	
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, acetone	
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	Not described	
LC ₅₀ (µg/L)	6	Method: NR

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism age (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), Statistical methods (5), Hypothesis tests (8). -56

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), Organisms/rep (2), Feeding (3), 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). -76

Toxicity Data Summary

Cyprinus carpio

Study: Reddy PM, Bashamohideen M. 1995. Modulation in the levels of respiration and ions in carp *Cyprinus carpio* (L.) exposed to cypermethrin. Environmental Monitoring and Assessment 35:221-226.

Relevance

Score: n/a

Rating: N

Reliability

Score:

Rating:

*Organisms were only exposed to one concentration (20 ug/L), which exceeded 2x the aqueous solubility of cypermethrin (4 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 (50-70 ug/L) exceeded 2x aqueous solubility of cypermethrin (4 ug/L).

Toxicity Data Summary

Chironomus decorus
Chironomus utahensis
Procladius spp.

Study: Ali 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 JJ, Lee S, Werner I. 2004. Isomer selectivity in aquatic toxicity and biodegradation of cypermethrin. J Agric Food Chem 52:6233-6238.

Relevance

Score: 92.5

Rating: R

Reliability

Score: 50.5

Rating: N

*Control response not reported

	Liu et al. 2004	<i>C. dubia</i>
Parameter	Value	Comment
Test method cited	USEPA 2002	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	<i>Ceriodaphnia</i>	
Species	<i>dubia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Neonates, <20 h	
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	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted moderately hard water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Appendix B2: studies rated RN, LN, N

	Liu et al. 2004	<i>C. dubia</i>
Parameter	Value	Comment
Feeding	None during test, fed 4 h prior to 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	0.0002 % acetone	
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	Solvent	4 reps, 5/rep
LC ₅₀ (µg/L)	0.889	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Organism source (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). -43

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), 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). -56

Toxicity Data Summary

Culex fuscocephala

Culex triaeniorhynchus

Study: Vijayan VA, Revanna MA, Vasudeva KS, Pushpalatha & Poornima N. 1993. Comparative susceptibility of two Japanese encephalitis vectors from Mysore to six insecticides. Indian J Med Res A 97:215-217.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Control response not acceptable (<20% mortality)

Toxicity Data Summary

Culex pipiens pallens

Study: Lee D-K, Shin E-H, Shim J-C. 1997. Insecticide susceptibility of *Culex pipiens pallens* (Culicidae, Diptera) larvae in Seoul. Korean Journal of Entomology 27:9-13.

Relevance

Score: 92.5

Rating: R

Reliability

Score: 59

Rating: N

*Control response not reported

	Lee et al. 1997	<i>C. pipiens pallens</i>
Parameter	Value	Comment
Test method cited	WHO 1981	
Phylum		
Class		
Order		
Family		
Genus	<i>Culex</i>	
Species	<i>pipiens pallens</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	3 rd –early 4 th instar larvae	
Source of organisms	Lab culture (parental generation collected in field)	
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	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Appendix B2: studies rated RN, LN, N

	Lee et al. 1997	<i>C. pipiens pallens</i>
Parameter	Value	Comment
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 or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.4% (1mL EtOH/249 mL dil water)	
Concentration 1 Nom/Meas (µg/L)	5- 6 concentrations	3 reps, 25/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 25/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 25/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 25/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 25/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 25/rep
Control	Solvent	3 reps, 25/rep
LC ₅₀ (µg/L)	0.791 (0.683-0.917)	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): Control response (9), Measured concentrations within 20% of nominal (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), Dilution factor (2), Hypothesis tests (3). -44

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	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
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	

Appendix B2: studies rated RN, LN, N

	Hardstone et al. 2007	<i>C. pipiens quinquefasciatus</i>
Parameter	Value	Comment
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 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: 0.79 (0.74-0.85)	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

Study: Helson BV, Surgeoner GA. 1986. Efficacy of cypermethrin for the control of mosquito larvae and pupae, and impact on non-target organisms, including fish. Journal of the American Mosquito Control Association 2:269-275.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56.5

Rating: N

*No standard method, unacceptable control response

	Helson & Surgeoner 1986	<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>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Simulated pools at research center (plastic pools filled with water and leaf litter)	
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	14 ± 1°C 27 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	

Appendix B2: studies rated RN, LN, N

	Helson & Surgeoner 1986	<i>C. pipiens</i>
Parameter	Value	Comment
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	92.7%	
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	0.5% acetone	
Concentration 1 Nom/Meas (µg/L)	# of concentrations NR	2 tests, 2 reps, 20/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	Solvent and dilution water	2 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	14°C: 0.057 (0.050-0.065) 27°C: 0.175 (0.150-0.205)	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), 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). -53

Toxicity Data Summary

Channa punctatus

Study: Kumar A, Sharma B, Pandey RS. 2007. Preliminary evaluation of the acute toxicity of cypermethrin and lambda-cyhalothrin to *Channa punctatus*. Bull Environ Contam Toxicol, 79: 613-616.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Reported LC50 (400 ug/L) > 2x aqueous solubility of cypermethrin (4 ug/L).

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	

Appendix B2: studies rated RN, LN, N

	Ali et al. 1999	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	Yes, once at beginning of test	
Purity of test substance	92.3%	
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)	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)	0.17 (0.12-0.25)	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: Mulla MS, Darwazeh HA, Ede L. 1982. Evaluation of new pyrethroids against immature mosquitoes and their effects on nontarget organisms. Mosquito News 42:583-590.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 48

Rating: N

*No standard method, control response not reported

	Mulla et al. 1982	<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	NR	
Have organisms been exposed to contaminants?	NR	
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	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	

Appendix B2: studies rated RN, LN, N

	Mulla et al. 1982	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
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	
Concentration 1 Nom/Meas (µg/L)	3-4 concentrations	2-3 tests, 3 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	2-3 tests, 3 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	2-3 tests, 3 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	2-3 tests, 3 reps, 20/rep
Control	Solvent	2-3 tests, 3 reps, 20/rep
LC ₅₀ (µg/L)	Larvae: 0.05 Pupae: 0.40	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Organism source (5), 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). -39

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), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -65

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	

Appendix B2: studies rated RN, LN, N

	Vijayan & Ningegowda 1993	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	1%	
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: 0.3890 Mandya: 0.4800	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	

Appendix B2: studies rated RN, LN, N

	Weerasinghe et al. 2001	<i>C. quinquefasciatus</i>
Parameter	Value	Comment
Feeding	None during test	
Purity of test substance	94.5%	
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)	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)	2.1 (1.9-2.4)	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 restuans

Study: Helson BV, Surgeoner GA. 1986. Efficacy of cypermethrin for the control of mosquito larvae and pupae, and impact on non-target organisms, including fish. Journal of the American Mosquito Control Association 2:269-275.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 56.5

Rating: N

*No standard method, unacceptable control response

	Helson & Surgeoner 1986	<i>C. restuans</i>
Parameter	Value	Comment
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Culex</i>	
Species	<i>restuans</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	4 th instar larvae	
Source of organisms	Collected in field – natural breeding sites near Guelph, Canada	
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	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Appendix B2: studies rated RN, LN, N

	Helson & Surgeoner 1986	<i>C. restuans</i>
Parameter	Value	Comment
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	92.7%	
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	0.5% acetone	
Concentration 1 Nom/Meas (µg/L)	# of concentrations NR	2 tests, 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	Solvent and dilution water	2 reps, 20/rep
LC ₅₀ (95% confidence interval) (µg/L)	0.073 (0.066-0.080)	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), 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). -53

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

Callinectes sapidus

Study: Lee R, Oshima Y. 1998. Effects of selected pesticides, metals and organometallics on development of blue crab (*Callinectes sapidus*) embryos. Marine Environmental Research 46:479-482.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, saltwater, chemical purity not reported

Toxicity Data Summary

Callinectes sapidus

Study: Lee RF, Steinert SA, Nakayama K, Oshima Y. 1999. Use of DNA strand damage (Comet assay) and embryo hatching effects to assess contaminant exposure in blue crab (*Callinectes sapidus*) embryos. In: Henshel DS, Black MC, Harrass MC. Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disruption and Environmental Assessment, 8th volume. ASTM STP 1364, West Conshohocken, PA. p. 341-349.

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

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	

Appendix B2: studies rated RN, LN, N

	Reza & Vijayan 2006	<i>C. tritaeniorhynchus</i>
Parameter	Value	Comment
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	93.7%	
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: 0.5-32	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: 2.62 (0.9-5.59) Type B: 2.71 (2.18-3.19)	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), 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: Overman MA, Barron MG, Vaishnav DD. 1990. Cypermethrin-S (FMC 56701): Acute toxicity to sheepshead minnow (*Cyprinodon variegatus*) under flow-through test conditions. FMC Study: A89-2937-01. Laboratory project ID: ESE No. 3903026-0600-3140. Environmental Science and Engineering, Inc. (ESE): Gainesville, FL. CDPR ID: 118787.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

This study uses cypermethrin-S, not racemic cypermethrin, therefore the data cannot be used.

Toxicity Data Summary

Daphnia magna

Study: Christensen BT, Lauridsen TL, Ravn HW, Bayley M. 2005. A comparison of feeding efficiency and swimming ability of *Daphnia magna* exposed to cypermethrin. *Aquatic Toxicology* 73:210-220.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 44.5
Rating: N

*No standard method, control not described

	Christensen et al. 2005	<i>D. magna</i>
Parameter	Value	Comment
Test method cited	None cited	
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	7-9 d old	
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	7 d	
Data for multiple times?	Yes	
Effect 1	Growth (freeze-dried weight)	
Control response 1	3 d: 170 ug/individual	
Temperature	NR	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Adam-zooplankton medium	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

Appendix B2: studies rated RN, LN, N

	Christensen et al. 2005	<i>D. magna</i>
Parameter	Value	Comment
Feeding	Fed during test at least every 2 nd day	
Purity of test substance	Analytical 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	% NR, acetone	
Concentration 1 Nom/Meas (µg/L)	1.0	Reps and # per: NR
Concentration 2 Nom/Meas (µg/L)	0.6	Reps and # per: NR
Concentration 3 Nom/Meas (µg/L)	0.3	Reps and # per: NR
Concentration 4 Nom/Meas (µg/L)	0.2	Reps and # per: NR
Concentration 5 Nom/Meas (µg/L)	0.1/0.085	Reps and # per: NR
Concentration 6 Nom/Meas (µg/L)	0.05/0.046	Reps and # per: NR
Control	Not described	Reps and # per: NR
NOEC	72 h: 0.2	Method: ANOVA p: NR MSD: NR
LOEC	72 h: 0.3	Same as above
MATC (GeoMean NOEC,LOEC)	72 h: 0.25	
% of control at NOEC*	168/170= 99%	
% of control at LOEC*	75/170= 44%	

Notes: *estimated from Fig 2

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), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Significance level (2), Minimum significant difference (2), % control of NOEC/LOEC (2), Point estimates (8). -52

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Organisms/rep (2), 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), Minimum significant difference (1), Point estimates (3). -59

Toxicity Data Summary

Daphnia magna

Lepomis macrochirus

Study: Rand GM. 1984. Acute aquatic toxicity of Ammo (FMC 45806) oil vs. water. CDPR ID: 32854.

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

Daphnia magna

Study: Meems N, Steinberg CEW, Wiegand C. 2004. Direct and interacting toxicological effects on the waterflea (*Daphnia magna*) by natural organic matter, synthetic humic substances and cypermethrin. The Science of the Total Environment 319:123-136.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Toxicity values not calculated

Toxicity Data Summary

Daphnia magna

Study: Palmieri MA. 1984. Acute toxicity of FMC 45806 diluted in soybean oil (0.1 pounds A.I./quart) and in water (0.1 pounds A.I./gallon) to *Daphnia magna*. Springborn Bionomics, Inc. study numbers A84-1446, A84-1447. CDPR ID: 32852.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method (10), low chemical purity (15), control response not reported (7.5)

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 65 ug/L > 2x aqueous solubility (4 ug/L)

Toxicity Data Summary

Gambusia affinis

Study: Bonner JC, Yarbrough JD. 1989. Role of the brain *t*-butylbicyclophosphorothionate receptor in vertebrate resistance to endrin, 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane and cypermethrin. The Journal of Pharmacology and Experimental Therapeutics.

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

Galaxias maculatus

Study: Davies PE, Cook LSJ, Goenarso D. 1994. Sublethal responses to pesticides of several species of Australian freshwater fish and crustaceans and rainbow trout. Environ Toxicol Chem 13:1341-1354.

Relevance

Score: 68.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, family not found in North America, control response not reported

Toxicity Data Summary

Homarus americanus

Study: Burrige LE, Haya K, Page FH, Waddy SL, Zitko V, Wade J. 2000. The lethality of the cypermethrin formulation Excis® to larval and post-larval stages of the American lobster (*Homarus americanus*). *Aquaculture* 182:37-47.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

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

Toxicity Data Summary

Homarus americanus

Study: Burridge LE, Haya K, Waddy SL, Wade J. 2000. The lethality of anti-sea lice formulations Salmosan® (Azamethiphos) and Excis® (Cypermethrin) to stage IV and adult lobsters (*Homarus americanus*) during repeated short-term exposures. Aquaculture 182:27-35.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Low chemical purity

Toxicity Data Summary

Homarus americanus

Study: Pahl BC, Opitz HM. 1999. The effects of cypermethrin (Excis) and azamethiphos (Salmosan) on lobster *Homarus americanus* H. Milne Edwards larvae in a laboratory study. Aquaculture Research 30:655-665.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Saltwater, Low chemical purity

Toxicity Data Summary

Heteropneustes fossilis

Study: Ansari BA, Kumar K. 1988. Cypermethrin toxicity: Effect on the carbohydrate metabolism of the Indian catfish, *Heteropneustes fossilis*. The Science of the Total Environment 72:161-166.

Relevance

Score: 52.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Chemical purity not reported, Family of species does not reside in North America, Control response not reported

Toxicity Data Summary

Heteropneustes fossilis

Study: Saha S, Kaviraj A. 2003. Acute toxicity of synthetic pyrethroid cypermethrin to freshwater catfish *Heteropneustes fossilis* (Bloch). Internation Journal of Toxicology 22:325-328.

Relevance

Score: 62.5

Rating: N

Reliability

Score: n/a

Rating: n/a

*Low chemical purity, Species is not from a family that resides in North America, Control response not reported

Toxicity Data Summary

Hypsiboas pulchellus

Study: Agostini MG, Natale GS, Ronco AE. 2010. Lethal and sublethal effects of cypermethrin to *Hypsiboas pulchellus* tadpoles. *Ecotoxicology* 19:1545-1550.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*LC50 (479.7 ug/L) exceeds 2x the aqueous solubility of cypermethrin (4 ug/L).

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 cypermethrin.

Toxicity Data Summary

Lesistes reticulatus

Study: Caliskan M, Erkmen B, Yerli SV. 2003. The effects of zeta cypermethrin on the gills of common guppy *Lebistes reticulatus*. Environ Toxicol Pharmacol 14:117-120.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Test with zeta-cypermethrin, not racemic cypermethrin.

Toxicity Data Summary

Labeo rohita

Study: Adhikari S, Sarkar B, Chatterjee A, Mahapatra CT, Ayyappan S. 2004. Effects of cypermethrin and carbofuran on certain hematological parameters and prediction of their recovery in a freshwater teleost, *Labeo rohita* (Hamilton). *Ecotoxicology and Environmental Safety* 58:220-226.

Relevance

Score: 60

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Endpoint not linked to survival/growth/reproduction, Low chemical purity

Toxicity Data Summary

Labeo rohita

Study: Das BK, Mukherjee SC. 2003. Toxicity of cypermethrin in *Labeo rohita* fingerlings: biochemical, enzymatic and haematological consequences. Comparative Biochemistry and Physiology C 134:109-121.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All LC50s (130-225 ug/L) exceed 2x the aqueous solubility of cypermethrin (4 ug/L).

Toxicity Data Summary

Labeo rohita

Study: Deshpande VY, Muley DV, Bhilave MP. 2007. Pyrethroid induced respiratory changes in *Labeo rohita*. Nature Environment and Pollution Technology 6:277-280.

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

Mytilus edulis

Study: Gowland B, Webster L, Fryer R, Davies I, Moffat C, Stagg R. 2002. Uptake and effects of the cypermethrin-containing sea lice treatment Excis® in the marine mussel, *Mytilus edulis*. Environmental Pollution 120:805-811.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested (10-100 ug/L) exceeded 2x the aqueous solubility of cypermethrin (4 ug/L).

Toxicity Data Summary

Scenedesmus bijugatus
Synechococcus elongatus
Nostoc linckia
Phormidium tenue

Study: Megharaj M, Venkateswarlu K, Rao AS. 1987. Influence of cypermethrin and fenvalerate on a green alga and three cyanobacteria isolated from soil. *Ecotoxicology and Environmental Safety* 14:142-146.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested (5-50 mg/L) exceeded 2x the aqueous solubility of cypermethrin (4 ug/L)

Toxicity Data Summary

Nilaparvata lugens
Oreochromis niloticus
Poecilia reticulata

Study: Tejada AW, Bajet CM, Magbauna MG, Gambalan NB, Araez LC, Magallona ED. 1994. Toxicity of pesticides to target and non-target fauna of the lowland rice ecosystem. In: Widianarko B, Vink K, Van Straalen NM (eds). *Environmental Toxicology in South East Asia*. VU University Press: Amsterdam, Netherlands. p. 89-103.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All reported LC50s (31-10900 ug/L) exceed 2x the aqueous solubility of cypermethrin (4 ug/L).

Toxicity Data Summary

Oryzias latipes

Study: Kim Y, Jung J, Oh S, Choi K. 2008. Aquatic toxicity of cartap and cypermethrin to different life stages of *Daphnia magna* and *Oryzias latipes*. Journal of Environmental Science and Health B 43:56-64.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All toxicity values (18-111.4 ug/L) exceed 2x the aqueous solubility of cypermethrin (4 ug/L)

Toxicity Data Summary

Oncorhynchus mykiss

Study: Bradbury SP, Carlson RW, Niemi GJ, Henry TR. 1991. Use of respiratory-cardiovascular responses of rainbow trout (*Oncorhynchus mykiss*) in identifying acute toxicity syndromes in fish: Part 4. Central nervous system seizure agents. Environ Toxicol Chem 10:115-131.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*The reported toxicity values exceed 2x the aqueous solubility of cypermethrin.

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 55 ug/L > 2x aqueous solubility (4 ug/L)

Toxicity Data Summary

Oncorhynchus mykiss

Rana temporaria

Study: Edwards R, Millburn, Hutson DH. 1986. Comparative toxicity of cis-cypermethrin in rainbow trout, frog, mouse, and quail. Toxicology and Applied Pharmacology 84:512-522.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Uses cis-cypermethrin, not racemic cypermethrin, therefore data cannot be used.

Toxicity Data Summary

Oncorhynchus mykiss

Study: Shires SW. 1985. Toxicity of a new pyrethroid insecticide, WL85871, to rainbow trout. Bull Environ Contam Toxicol 34:134-137.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Study uses cis-cypermethrin (alpha-cypermethrin) not racemic cypermethrin, therefore it is not appropriate to include in the data base.

Toxicity Data Summary

Oreochromis niloticus

Study: Yilmaz M. 2005. Acute toxicity of alpha-cypermethrin on tilapia (*Oreochromis niloticus* L.) larvae. Bull Environ Contam Toxicol 74:880-885.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Study uses alpha-cypermethrin, not racemic cypermethrin, therefore the data is not appropriate for use.

Toxicity Data Summary

Oncorhynchus mykiss

Study: Overman MA, Barron MG, Vaishnav DD. 1990. Cypermethrin-S (FMC 56701): Acute toxicity to rainbow trout (*Oncorhynchus mykiss*) under flow-through conditions. FMC Corporation study number A89-2935-01. Laboratory project ID: ESE No. 3903026-0700-3140. Environmental Science and Engineering, Inc. (ESE): Gainesville, FL. CDPR ID: 118784.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*This study uses cypermethrin-S, not racemic cypermethrin, thus, the data cannot be used.

Toxicity Data Summary

Physalaemus biligonigerus

Study: Izaguirre MF, Lajmanovich RC, Peltzer PM, Soler AP, Casco VH. 2000.
Cypermethrin-induced apoptosis in the telencephalon of *Physalaemus biligonigerus* tadpoles
(Anura: Leptodactylidae). Bull Environ Contam Toxicol 65:501-507.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All reported LC50s (129-1012 ug/L) exceeded 2x the aqueous solubility of cypermethrin (4 ug/L)

Toxicity Data Summary

Physalaemus biligonigerus

Study: Lajmanovich R, Lorenzatti E, de la Sierra P, Marino F, Stringhini G, Peltzer P. 2003. Reduction in the mortality of tadpoles (*Physalaemus biligonigerus*; Amphibia: Leptodactylidae) exposed to cypermethrin in presence of aquatic ferns. Fresenius Environmental Bulletin 12:1558-1561.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*All concentrations tested (35-945 ug/L) exceeded 2x the aqueous solubility of cypermethrin (4 ug/L)

Toxicity Data Summary

Prochilodus lineatus

Study: Parma MJ, Loteste A, Campana M, Bacchetta C. 2007. Changes of hematological parameters in *Prochilodus lineatus* (Pisces, Prochilodontidae) exposed to sublethal concentration of cypermethrin. Journal of Environmental Biology 28:147-149.

Relevance

Score: 30

Rating: N

Reliability

Score: n/a

Rating: n/a

*No standard method, Endpoint not linked to survival/growth/reproduction, Chemical purity not reported, Species not in a family of North America, Toxicity values not calculable.

Toxicity Data Summary

Palaemonetes pugio

Study: Clark JR, Patrick JM, Moore JC, Lores EM. 1987. Waterborne and sediment-source toxicities of six organic chemicals to grass shrimp (*Palaemonetes pugio*) and Amphioxus (*Branchiostoma caribaeum*). Arch Environ Contam Toxicol 16:401-407.

Relevance

Score: 77.5

Rating: L

Reliability

Score: 52

Rating: N

*Saltwater, Control response not reported

	Clark et al. 1987	<i>P. pugio</i>
Parameter	Value	Comment
Test method cited	APHA 1985, USEPA 1978	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Palaemonidea	
Genus	<i>Palaemonetes</i>	
Species	<i>pugio</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adult	
Source of organisms	Collected from shorelines in Florida	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Acclimated for 1 week	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	22 or 25 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	
pH	7.8-8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	

Appendix B2: studies rated RN, LN, N

	Clark et al. 1987	<i>P. pugio</i>
Parameter	Value	Comment
Dissolved Oxygen	>70% saturation	
Feeding	NR	
Purity of test substance	Reagent grade	
Concentrations measured?	Yes	
Measured is what % of nominal?	75-95%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	%NR, acetone or triethylene glycol	
Concentration 1 Nom/Meas (µg/L)	NR	1 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 and dilution water	1 rep
LC ₅₀ (µg/L)	0.016	Method: probit or binomial analysis

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Temperature (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), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), 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), Hypothesis tests (3). -62

Toxicity Data Summary

Poecilia reticulata

Study: Polat H, Erkoc FU, Viran R, Kocak O. 2002. Investigation of acute toxicity of beta-cypermethrin on guppies *Poecilia reticulata*. Chemosphere 49:39-44.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Study tests beta-cypermethrin, not racemic cypermethrin, therefore data cannot be used.

Toxicity Data Summary

Scendesmus obliquus

Study: Li X, Ping X, Xiumei S, Zhenbin W, Liquiang X. 2005. Toxicity of cypermethrin on growth, pigments, and superoxide dismutase of *Scendesmus obliquus*. *Ecotoxicology and Environmental Safety* 60:188-192.

Relevance

Score: n/a

Rating: N

Reliability

Score: n/a

Rating: n/a

*Reported toxicity values (112 mg/L) exceed 2x the aqueous solubility of cypermethrin (4 ug/L)

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	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	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	

Appendix B2: studies rated RN, LN, N

	McLeese et al. 1980	<i>S. salar</i>
Parameter	Value	Comment
Feeding	NR	
Purity of test substance	98.5%	
Concentrations measured?	Yes	
Measured is what % of nominal?	68%	
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)	2.0	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: Moore A, Waring CP. 2001. The effects of a synthetic pyrethroid pesticide on some aspects of reproduction in Atlantic salmon (*Salmo salar* L.). *Aquatic Toxicology* 52:1-12.

Relevance

Score: 45-52.5 depending on effect

Rating: N

Reliability

Score: n/a

Rating: n/a

*Effect 1) Olfactory detection of PGF_{2α}: No standard method, Endpoint not clearly linked to reproduction, Chemical purity not reported, Toxicity value not calculable.

*Effect 2) Priming response of males to PGF_{2α}: No standard method, Endpoint not clearly linked to reproduction, Chemical purity not reported, Toxicity value not calculable.

*Effect 3) Egg fertilization: No standard method, Chemical purity not reported, Toxicity value not calculable, Control response not reported.

Toxicity Data Summary

Triops longicaudatus

Study: Walton WE, Darwazeh HA, Mulla MS, Schreiber ET. 1990. Impact of selected synthetic pyrethroids and organophosphorous pesticides on the tadpole shrimp, *Triops longicaudatus* (Le Conte) (Notostraca: Triopsidae). Bull Environ Contam Toxicol 45:62-68.

Relevance

Score: 67.5

Rating: N

Reliability

Score: n/a

Rating: n/a

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