Water Quality Criteria Report for Imidacloprid

Phase III: Application of the pesticide water quality criteria methodology

Prepared for the Central Coast Regional Water Quality Control Board

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June 2019

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Funding for this project was provided by the State of California Central Coast Regional Water Quality Control Board (CCRWQCB). The contents of this document do not necessarily reflect the views and policies of the CCRWQCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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List of acronyms and abbreviations

ACR	Acute-to-Chronic Ratio
AF	Assessment factor
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BMF	Biomagnification Factor
CAS	Chemical Abstract Service
CDFG	California Department of Fish and Game
CSIRO	Commonwealth Scientific and Industrial Research Organization, Australia
CVRWQCB	Central Valley Regional Water Quality Control Board
CCRWQCB	Central Coast Regional Water Quality Control Board
DPR	Department of Pesticide Regulation
EC_x	Concentration that affects x% of exposed organisms
FDA	Food and Drug Administration
FT	Flow-through test
IC_x	Inhibition concentration; concentration causing *x*% inhibition
ICE	Interspecies Correlation Estimation
IUPAC	International Union of Pure and Applied Chemistry
K	Interaction Coefficient
K_H	Henry's law constant
K_{ow}	Octanol-Water partition coefficient
K_p or K_d	Solid-Water partition coefficient
LC_x	Concentration lethal to *x*% of exposed organisms
LD_x	Dose lethal to *x*% of exposed organisms
LL	Less relevant, Less reliable study
LOEC	Lowest-Observed Effect Concentration
LR	Less relevant, Reliable study
MATC	Maximum Acceptable Toxicant Concentration
MDL	Method Detection Limit
N	Not relevant or Not reliable study
n/a	Not applicable
NOEC	No-Observed Effect Concentration
NR	Not reported
OECD	Organization for Economic Co-operation and Development
pK_a	Acid dissociation constant
RL	Relevant, Less reliable study
RR	Relevant and Reliable study
S	Static test
SMACR	Species Mean Acute-to-Chronic Ratio
SMAV	Species Mean Acute Value
SR	Static renewal test
SSD	Species Sensitivity Distribution

TES	Threatened and Endangered Species
US	United States
USEPA	United States Environmental Protection Agency

1 Introduction

1.1 Introduction to imidacloprid

This criteria report for imidacloprid describes, section by section, the procedures used to derive aquatic toxicity criteria according to the UC-Davis methodology (see Section 1.2). References are included to specific sections of the methodology so that the reader can refer to the report for further details.

In the environment, imidacloprid degrades to several metabolites that are more or less stable. Metabolites are formed through photolysis as well as aerobic or anaerobic metabolism in soil and/or water (Figure 2). This criteria report includes toxicity data for metabolites when available. Some sections do not mention a particular metabolite due to a dearth of data for that particular chemical species. The data tables containing metabolite data are color coded to assist the reader in separating each of the metabolites from the parent compound imidacloprid.

1.2 Method background

A methodology for deriving freshwater water quality criteria for the protection of aquatic life was developed by the University of California - Davis (TenBrook et al. 2009a). The need for a methodology was identified by the California Central Valley Regional Water Quality Control Board (CVRWQCB 2006) and findings from a review of existing methodologies (TenBrook & Tjeerdema 2006, TenBrook et al. 2009b). The UC-Davis methodology has been used to derive aquatic life criteria for several pesticides of particular concern in the Sacramento River and San Joaquin River watersheds. It is now being used to derive aquatic life criteria for the watersheds under the jurisdiction of the Central Coast Regional Water Quality Control Board (CCRWQCB). The methodology report (TenBrook et al. 2009a) contains an introduction (Chapter 1); the rationale of the selection of specific methods (Chapter 2); detailed procedure for criteria derivation (Chapter 3); and a criteria report for a specific pesticide (Chapter 4). In 2014 a sediment methodology was developed by University of California - Davis (Fojut et al. 2014), which contains some updated parameters that are relevant for calculating freshwater water quality criteria. These include Assessment Factor and Acute-to-Chronic Ratio parameters (AF and ACR, respectively). Sections 3-3.3 (AF) and 3-4.2.3 (ACR) of the aquatic method state that these parameters can be recalculated and updated if additional relevant data become available (TenBrook et al. 2009a). Unless otherwise specified, mentions of the methodology refer to the aquatic method (TenBrook et al. 2009a). The sediment method will be specifically referenced for clarity (Fojut et al. 2014).

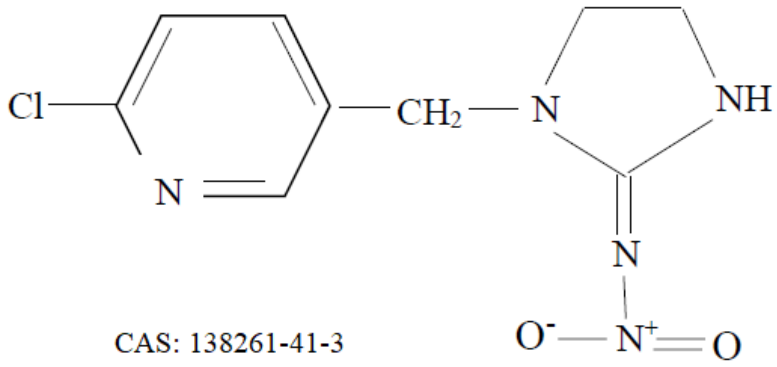
2 Basic information

Imidacloprid is a nitroguanidine-substituted neonicotinoid insecticide that is applied to domestic animals, structures, agricultural crops, residential garden plants, and soil for pest control. It works systemically on applied plants and animals, translocating throughout living tissue so that insects may come into contact with the insecticide when affected tissue is bitten, chewed, or otherwise consumed. It acts by disrupting the insect nervous system by outcompeting acetylcholine for binding sites on nicotinic acetylcholine receptors (USEPA 2016).

Chemical: Imidacloprid (Fig. 1)
CAS: 2-Imidazolidinimine, 1-[(6-chloro-3-pyridinyl)methyl]-N-nitro-
CAS Numbers:

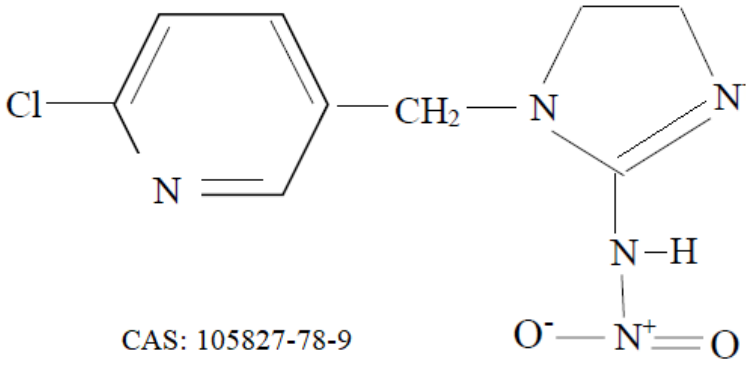
1. 138261-41-3
   (USEPA 2016, 2017, 2018)
2. 105827-78-9
   (CDPR 2018, PubChem 2018)

USEPA PC Code: 036101
CA DPR Chem Code: 597
IUPAC: (NE)-N-[1-[(6-chloropyridin-3-yl)methyl]imidazolidin-2-ylidene]nitramideChemical Formula: $C_{13}H_{16}F_3N_3O_4$



CAS: 138261-41-3

USEPA 2016



CAS: 105827-78-9

Based on PubChem 2018

Figure 1 Structures of imidacloprid

Trade names: Admire Advantage Flea Adulticide, Advise, AE-F 106464-0GR01B0, AEF 106464, AGST 03001, Alias, Baimieshi, BAY-NTN 33893, Bayer Advanced Season-Long Grub control, CCRIS 9318, Comodor, Confidate, Confidor, CoreTect, Couraze, CP 1, EC 428-040-8, Gaucho, Genesis, Grubex, Hachikusan, HSDB 7373, Imicide, Kohinor, Macho Max, Mallet 2F, Marathon, Merit, Meritgreen, NTN 33893, Premis, Premise, Preventol, ProAgro, Provado, Senator, Trimax Pro, and UNII-3BN7M937V8

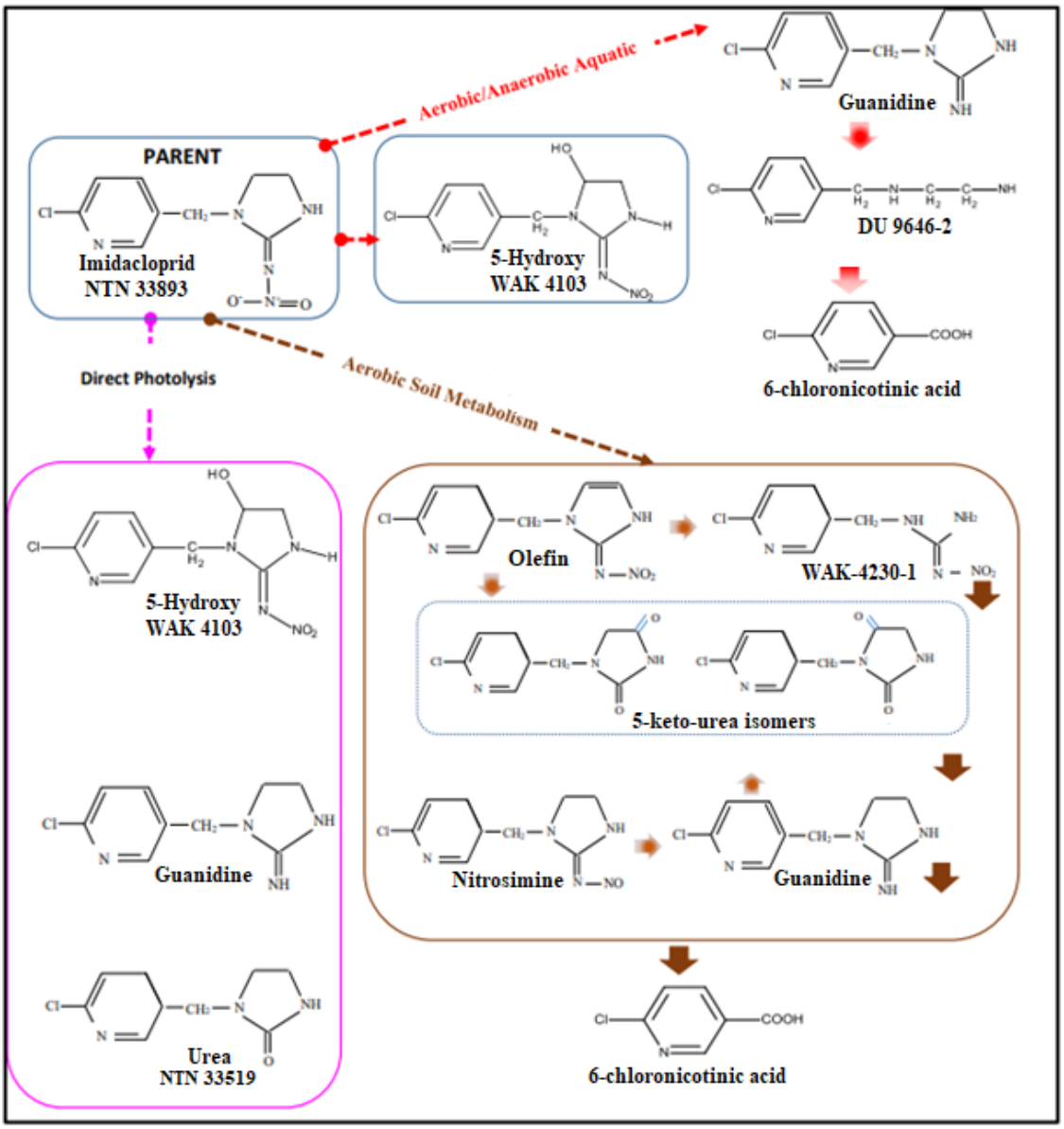


Figure 2 Imidacloprid degradation pathway.

Toxicity data was not available for all metabolites. Adapted from USEPA 2016.

3 Physical-chemical data, Bioconcentration, and Fate

Molecular Weight
255.661 g/mole

(https://webbook.nist.gov/cgi/inchi/InChI%3D1S/C9H10ClN5O2/c10-8-2-1-7(5-12-8)6-14-4-3-11-9(14)13-15(16)17/h1-2%2C5H%2C3-4%2C6H2%2C(H%2C11%2C13))

Density
1.54 g/mL (PPDB 2016)

Water Solubility

490 mg/L at unknown temperature	(Kagabu 1998)
500 mg/L at unknown temperature	(Cox 1997)
510 mg/L at 20ºC	(EXTOXNET 2016)
580 mg/L at unknown temperature	(USEPA 2017)
613 mg/L (demineralised water, pH 5.5, 20 °C)	(EFSA 2008)
607 mg/L (pH 4, 20 °C)	(EFSA 2008)
601 mg/L (pH 9, 20 °C)	(EFSA 2008)

Geometric mean: 555 mg/L

Melting Point

136.4°C	(EXTOXNET 2016)
143.8°C	(EXTOXNET 2016)
144°C	(PPDB 2016)
154.21°C	(EPI Suite, USEPA 2015)

Geometric mean: 144°C

Vapor Pressure

0.213316 mPa at 25°C	(EPI Suite, USEPA 2015)
$4x10^{-7}$ mPa at 20°C	(EFSA 2008)
$9x10^{-7}$ mPa extrapolated between 50-70°C	(EFSA 2008)
0.0002 mPa at 20°C	(EXTOXNET 2016)

Geometric mean: $6x10^{-5}$ mPa = 0.06 µPa

pKa
No dissociation (EFSA 2008)

Henry's constant (K_H)

1.05 x 10^{-8} Pa m^3 mol^{-1} at 25°C	(USEPA 2015)
1.082 x 10^{-8} Pa m^3 mol^{-1} at 25°C	(USEPA 2015)
1.7X10^{-10} Pa m^3 mol^{-1} at 20°C	(EFSA 2015)
1.7X10^{-10} Pa m^3 mol^{-1} at 20°C	(EFSA 2008)

Geometric mean: 1.3 x 10^{-9} Pa m^3 mol^{-1}

Organic Carbon Sorption Partition Coefficients (log K_{oc})
3.199 (USEPA 2015)
1.007 (USEPA 2015)
2.719 (Cox et al. 1998a)
2.465 (Cox et al. 1998a)
2.919 (Cox et al. 1998a)
2.827 (Cox et al. 1998a)
2.430 (Cox et al. 1998a)
2.614 (Williams 1992a)
2.465 (Williams 1992a)
2.442 (Williams 1992a)
2.471 (Williams 1992a)
2.408 (Fritz 1988)
2.121 (Fritz 1988)
2.196 (Fritz 1988)
2.326 (Fritz 1988)
2.459 (Cox 1998)
1.991 (Cox 1998)
2.688 (Cox 1998)
2.358 (Cox 1998)
2.358 (Cox 1998)
2.657 (Cox 1998)
2.515 (Williams 1992b)
2.921 (Williams 1992b)
2.974 (Williams 1992b)
2.938 (Williams 1992b)
Geometric mean: 2.452
Arithmetic mean: 2.500

Log K_{ow}
0.57 (EFSA 2008)
0.57 (Tomlin 1999)
0.57 (Kidd 1994)
Geometric mean: 0.57

Bioconcentration Factor

Table 1 Bioconcentration factors (BCF) for imidacloprid

FT: flow-through, SR: static renewal, S: static, NR: not reported; values are on a wet weight basis and are not lipid-normalized.

Species	BCF	Exposure	Reference
NR	0.9014	NR	EPI Suite, USEPA 2015
NR	3.162	NR	EPI Suite, USEPA 2015
Brachydanio rerio	1.52	NR	Ding 2004, as reported in other studies, see note in Section 9.1
Brachydanio rerio	0.97	NR	Ding 2004, as reported in other studies, see note in Section 9.1
Australoheros facetus	1.1	S (Formulation)	Iturburu 2017
Australoheros facetus	0.5	S (Formulation)	Iturburu 2017
Australoheros facetus	0.3	S (Formulation)	Iturburu 2017
Australoheros facetus	0.2	S (Formulation)	Iturburu 2017
Australoheros facetus	0.7	S (Formulation)	Iturburu 2017
Australoheros facetus	0.8	S (Formulation)	Iturburu 2017
	GEOMEAN 0.8		

Environmental Fate

Table 2 Imidacloprid hydrolysis and photolysis and other degradation.

(NR: not reported).

	Half- life (h or d)	**Water**	**Temp (°C)**	**pH**	**Reference**
Hydrolysis	2.85 d	DI/distilled	Range: 10,20,25,30,40,50°C	11.8	Zheng & Liu 1999
	20 d	DI/distilled	Range: 10,20,25,30,40,50°C	10.8	Zheng & Liu 1999
	355 d	Milli Q SP water	25	9	Yoshida 1989
	Stable	Milli Q SP water	25	5	Yoshida 1989
	Stable	Milli Q SP water	25	7	Yoshida 1989
Aqueous Photolysis	0.314 h	Distilled	24	NR	Lavine et al. 2010
	2.3 h	Nanopure	NR	NR	Kurwadkar 2016
	0.95 h	Aqueous buffer	25	7.0	Anderson 1991
	1.2 h	Aqueous buffer	24	9.0	Moza 1998
	24.2 h	Rice paddy water	21-25	7.8	Thuyet 2011
	0.72 h	HPLC grade water	NR	NR	Wamhoff 1999
Soil Photolysis	38.9 d	Sandy loam	25	NR	Yoshida 1990
	830 h	Dried soil	25	NR	Graebing & Chib 2004
Biodegradation (aerobic)	990 d	Red brown earth	25	7.1	Baskaran 1999
	130-260 d (modeled)	Sandy clay	NR	7.12	Broznic & Milin 2013
	50-204 d (modeled)	Clay	NR	6.35	Broznic & Milin 2013
	>365 d	Sandy loam	20	NR	Anderson 1990
	341 d	Sandy loam	20	NR	Anderson 1992a

	188 d	Loamy sand	20	NR	Anderson 1992b
	248 d	Silt	20	NR	Anderson 1992c
	30 d	Drainage ditch water and sediment	22	7.9-8.9	Wilmes 1988
	162 d	Recultivated gravel quarry water and sediment	22	7.9-8.9	Wilmes 1988
	129 d	Agricultural pond water and sediment	22	8.43-8.89	Spiteller 1993
Biodegradation (anaerobic)	27 d	Pond water and sediment	22	5.9-7.4	Fritz 1991

4 Human and wildlife dietary values

There are no FDA action levels for imidacloprid in food (USFDA 2000) and there are no EPA pesticide tolerances set for any aquatic species (USEPA 2012).

Wildlife LC_{50} values (dietary) for animals with significant food sources in water

The Preliminary Aquatic Risk Assessment to Support the Reregistration Review of Imidacloprid does not contain any information regarding the toxicity of this pesticide to terrestrial wildlife, such as mallard ducks (USEPA 2016).

A 14-day acute exposure study on mallard duck (*Anus platyrhynchos*) resulted in an oral LC_{50} value of 283 mg/kg (Hancock 1996). No other acute LC_{50} data was available for wildlife species with significant food sources in water during the present report preparation. If highly rated measured data for mallard duck become available in the future, they should be examined to determine the potential risk to wildlife.

Wildlife dietary NOEC values for animals with significant food sources in water

A 19-week study on the reproductive effects of imidacloprid on *A. platyrhynchos* resulted in a NOEC of 47 mg/kg (Hancock 1994). Toll reported a MATC of 171 mg/kg from a 20-week study of the mallard (1991). No other NOEC data was available for wildlife species with significant food sources in water during the present report preparation. If highly rated measured data for mallard duck become available in the future, they should be examined to determine the potential risk to wildlife.

5 Ecotoxicity data

Approximately 41 original studies on the effects of imidacloprid on aquatic life were identified and reviewed. In the review process, many parameters were rated for documentation and acceptability for each study, including, but not limited to: organism source and care, control description and response, chemical purity, concentrations tested, water quality conditions, and statistical methods (see Tables 3.6, 3.7, 3.8 in TenBrook et al. 2009a). Single-species effects studies that were rated as relevant (R) or less relevant (L) according to the method (Table 3.6) were summarized in data summary sheets. Information in these summaries was used to evaluate each study for reliability, using the rating systems described in the methodology (Tables 3.7 and 3.8, section 3-2.2, TenBrook et al. 2009a), to give a reliability rating of reliable (R), less reliable (L), or not reliable (N).

Studies of the effects of imidacloprid on mallard ducks were rated for reliability using the terrestrial wildlife evaluation. Mallard studies rated as reliable (R) or less reliable (L) were used to consider bioaccumulation. Three studies for mallard duck rating R were located in the literature and are summarized in Section 4.

Copies of completed summaries for all aquatic studies are included in the Appendix of this report. All data rated as acceptable (RR) or supplemental (RL, LR, LL) for criteria derivation are summarized in Tables 3 - 10, found at the end of this report. Acceptable studies rated as RR are used for numeric criteria derivation, while supplemental studies rated as RL, LR or LL are used for evaluation of the criteria to check that they are protective of particularly sensitive species and threatened and endangered species. These considerations are reviewed in section 10.1 and 10.3 of this report, respectively. Studies that were rated not relevant (N) or not reliable (RN or LN) were not used for criteria derivation.

No acceptable microcosm studies were identified in the literature.

Evaluation of aquatic animal data

Using the data evaluation criteria (section 3-2.2, TenBrook et al. 2009a), 14 acute studies yielding 32 toxicity values from 29 taxa were judged reliable and relevant for acute criterion derivation (Tables 3-4). Fifty-seven acute toxicity animal values for 24 taxa from 14 studies were rated RL, LL, or LR and were used as supplemental information for evaluation of the derived acute criteria in the Sensitive Species section 10.1 (Table 5). Two acute toxicity animal values for two species from two studies were rated RL, LL, or LR for the imidacloprid metabolite, 6-chloronicotinic acid (Table 5). Two acute toxicity animal values for two species from a single study were rated RL, LL, or LR for the imidacloprid metabolite, imidacloprid urea or NTN 33519 (Table 5). Five chronic animal toxicity values from five studies were rated RR (Tables 7-8). One chronic toxicity animal value from one study was rated RL, LL, or LR (Table 10).

Evaluation of aquatic plant data

All plant studies were considered chronic because the typical endpoints of growth or reproduction are inherently chronic. One study yielding a single plant toxicity value was rated RR (Tables 6).

Plant studies are more difficult to interpret than animal data because a variety of endpoints may be used, but the significance of each one is less clear. In this methodology, only endpoints of growth or reproduction (measured by biomass) and tests lasting at least 24-h had the potential to be rated highly and used for criteria calculation, which is in accordance with standard methods (ASTM 2007a, 2007b; USEPA 1996). The plant studies were rated for quality using the data evaluation criteria described in the methodology (section 3-2.2, TenBrook et al. 2009a).

6 Data reduction

Multiple toxicity values for imidacloprid for the same species were reduced down to one species mean acute value (SMAV) or one species mean chronic value (SMCV) according to procedures described in the methodology (section 3-2.4, TenBrook et al. 2009a). Twelve studies were reduced from the final acute data set (Table 4). Nine studies were reduced from the final chronic data set (Table 8).

7 Acute criterion calculation

An acute criterion was calculated with acute animal toxicity data only, because plant toxicity tests are always considered chronic (section 3-2.1.1.1, TenBrook et al. 2009a). Since acceptable acute toxicity values were not available from the five required taxa for a species sensitivity distribution, the acute criterion was calculated using the Assessment Factor (AF) procedure (section 3-3.3, TenBrook et al. 2009a). Imidacloprid is an organic pesticide, and the AFs given in the methodology (Table 3.13, TenBrook et al. 2009a) are the most specific AFs available for organic pesticides. The methodology points out that the AFs are limited in that they are based on organochlorine, organophosphate, and pyrethroid pesticides, which are neurotoxic insecticides. Imidacloprid is a neurotoxic insecticide, thus, it is reasonable to use the AF procedure for imidacloprid.

Sections 3-3.3 of the aquatic method state that AFs can be recalculated and updated if additional relevant data become available (TenBrook et al. 2009a). The AFs for the aquatic criteria calculations were updated in 2014 after additional data became available for recalculation. These updated AF values are included in the sediment method (Fojut et al. 2014). The AFs given in the methodologies will be used for imidacloprid with the understanding that AFs based on measured pesticide toxicity data are likely more accurate than choosing an arbitrary AF. The methodology points out that AFs are recognized as a conservative approach for dealing with uncertainty in assessing risks posed by chemicals (section 2-3.2, TenBrook et al. 2009a). Using an AF to calculate a criterion always involves a high degree of uncertainty and there is potential for under- or over-protection, which is strongly dependent on the representation of sensitive species in

the available data set. The methodology instructs that the derived criterion should be compared to all available ecotoxicity data to ensure that it will be protective of all species (section 3-6.0, TenBrook et al. 2009a).

A species sensitivity distribution could not be used to derive the criterion because not all of the taxa requirements were met. Specifically, an acute value for a warm water fish was not found during the literature review process. Therefore, an assessment factor was used to derive the criterion, by dividing the lowest value in the acute dataset by a predetermined factor. The factors were first given in Table 3.13 of the water method and were then updated in the sediment method in Table 18. The number of required taxa was four resulting in an AF of 7.5. The acute value calculated using the AF represents an estimate of the median 5th percentile value of the SSD, which is the recommended acute value. The recommended acute value is divided by a factor of 2 to calculate the acute criterion (section 3-3.3, TenBrook et al. 2009a). Because the toxicity data used to calculate the criterion reported two significant figures, the criterion is rounded to two significant figures (section 3-3.2.6, TenBrook et al. 2009a).

Sanchez-Bayo and Goka 2006 aimed to determine whether the mock-ambient lighting in standard test conditions resulted in realistic toxicity estimates for imidacloprid. Tests were performed under standard lighting regimes as well as in complete darkness. The authors showed that any toxicity effects of imidacloprid photodegradation over the course of standard test durations of 48 hours were minimal and not statistically significant, which is in agreement with the photolytic half-life range of 0.3-24 hours (see Table 2). The lowest value in the acute data set was an EC_{50} of 1 µg/L based on immobility under dark conditions for the ostracod *C. seuratti* (Sanchez-Bayo and Goka 2006).

In the environment, imidacloprid will interact with aquatic species under ambient light conditions that vary between light and dark rather than under continuous darkness. Therefore, to calculate the acute criterion, it is most reasonable to utilize the lowest acute toxicity value for imidacloprid that was determined under the standard test conditions, as was done for all other toxicity tests. An acute criterion was calculated using the lowest value in the data set determined through testing under standard lighting conditions (cycling between light and darkness to mimic ambient environmental conditions). This was done using an immobility EC_{50} value for *C. dilutus* of 2.5 µg/L (Raby 2018a).

Acute value = lowest value in data set ÷ assessment factor
= estimated 5th percentile
= 2.5 µg/L ÷ 7.5
= 0.33 µg/L

Acute criterion = acute value ÷ 2
= 0.33 µg/L ÷ 2
= 0.17 µg/L

Acute criterion = 0.17 µg/L

8 Chronic criterion calculation

Acceptable chronic values were not available for five different species, so a distribution could not be fit to the available toxicity data (section 3-4.1, TenBrook et al. 2009a). The methodology instructs that in the absence of acceptable data to fit a distribution, the chronic criterion is calculated using an acute-to-chronic ratio (ACR) (section 3-4.2, TenBrook et al. 2009a). Additionally, the ACR procedure requires paired acute and chronic data from organisms in at least three different families including a fish, an invertebrate, and at least one other acutely sensitive species (section 3-4.2.1, TenBrook et al. 2009a). Highly rated paired acute and chronic studies were not available for a fish; therefore, a default ACR value was used in its place. The default value is 11.4 as updated in the sediment method for both aquatic and sediment ACR calculations (table 19, Fojut et al., 2014).

Highly rated acute and chronic studies were available for *Daphnia magna.* These values originated from different studies done in the same laboratory. However, Young 1990a used reverse osmosis well water whereas Young 1990b used hard blended water. Section 3-4.2.1 of the methodology allows for these studies to be used to calculate a species mean acute-to-chronic ratio (SMACR). An acute EC_{50} value based on immobility of 85,000 µg/L was used with a MATC based on reproduction, growth, and survival of 2,500 µg/L.

SMACR = acute toxicity value ÷ chronic toxicity value

D. magna SMACR = 85,000 µg/L ÷ 2,500 µg/L
= 34

Highly rated acute and chronic values were also available for *Chironomus tentans.* These values originated from the same study (Gagliano 1991). An acute value from a 96-hour exposure resulted in an LC_{50} of 10.5 µg/L. A chronic value from a 10-day exposure resulted in an MATC value based on growth of 0.91 µg/L.

SMACR = acute toxicity value ÷ chronic toxicity value

C. tentans SMACR = 10.5 µg/L ÷ 0.91 µg/L
= 11.5
= 12

The method instructs that if not enough freshwater data are available to fulfill the ACR data requirements, that saltwater species may be used. Ward tested the toxicity of imidacloprid to *Mysidopsis bahia* in two tests and reported LC_{50} values of 37.7 and 34.1 µg/L (1990a) for a geometric mean of 35.9 µg/L. The MATC values from two tests for growth of 3,806 and 230 ng/L (1991) in different studies that used the same dilution water resulted in a geometric mean of 935 ng/L or 0.935 µg/L. The MATC values from two tests for reproduction of 849 ng/L or 0.849 µg/L and >643 ng/L. The method prohibits the use of non-definitive values, which leaves one usable value for

reproduction. This allowed for calculation of a species mean acute-to-chronic ratio (SMACR) for *M. bahia* based on the lower reproduction value:

SMACR = acute toxicity value ÷ chronic toxicity value

M. bahia SMACR = 35.9 µg/L ÷ 0.849 µg/L
= 42.3

Final multispecies ACR = geometric mean of *D. magna* SMACR, *C. tentans* SMACR, *M. bahia* SMACR, and one default ACR for lack of fish SMACR
Final multispecies ACR = geomean(34, 12, 42.3, 11.4)
= 21.06
= 21

The chronic criterion was calculated using the final multispecies ACR of 21 as follows:

Chronic criterion = Recommended acute value ÷ final multispecies ACR
= 0.33 µg/L ÷ 21
= 0.0157 µg/L
Chronic criterion = 0.016 µg/L
= 16 ng/L

9 Water quality effects

9.1 Bioavailability

One study was found concerning the bioavailability of imidacloprid in the water column that differentiates between tissue type. The 2017 study by Iturburu et al. studied the biological uptake and tissue distribution in the freshwater fish *Australoheros facetus*. The geometric means of bioconcentration factors (BCF) across the tested concentrations ranged from 0.2 (muscle tissue) to 1.1 (brain tissue). However, this study used an imidacloprid formulation. Therefore, its values are for comparision purposes only.

Another study by Ding et al. 2004 reported BCF values for the freshwater fish *Brachydanio rerio* ranging between 0.97-1.52. These values are widely reported in review papers and toxicity studies, however, an English language version of the Ding et al. 2004 paper was not available at the time of this report so the validity of the study was not verifiable. However, it does appear to be an original study rather than a review itself.

No studies were found concerning the bioavailability of imidacloprid in the water column that differentiates when these compounds are sorbed to solids, sorbed to dissolved solids, or freely dissolved. Until there is more information that discusses the bioavailability of these three phases, it is recommended that compliance is based on the total concentration of imidacloprid in water (section 3-5.1, TenBrook et al. 2009a).

9.2 Mixtures

The concentration addition model and the non-additive interaction model are the only predictive mixture models recommended by the methodology (section 3-5.2, TenBrook et al. 2009a), so other models found in the literature will not be considered for compliance. Imidacloprid can occur in the environment with other pesticides of similar or different modes of action. Imidacloprid is a nitroguanidine-substituted neonicotinoid insecticide acts as a nervous system disrupter.

Several studies were available that explored toxicity mixture effects of imidacloprid on aquatic species. Maloney et al. (2017) studied a mixture of three neonicotinoids with similar modes of action with *Chironomus dilutus*. The mixtures were composed of imidacloprid and clothianidin and/or thiamethoxam in binary or ternary combinations. It was found that all mixture toxicities were best predicted with some form of response-additive synergism. In combination with clothianidin the model demonstrated dose level dependency while imidacloprid-thiamethoxam showed dose ratio dependency that varied between synergism and antagonism with increasing amounts of thiamethoxam. The ternary mixture displayed a standard response-additive model. Ahmed and Matsumura (2014) studied the synergistic action of the two formamidines amitraz and chlordimeform with imidacloprid on *Aedes aegypti* but did not fit models to the interactions. Similarly, Kunce et al. (2015) saw no synergism with imidacloprid in combination with the pyrethroids deltamethrin and esfenvalerate and did not fit models to the interactions. Imidacloprid was mixed with the organophosphate chlorpyrifos and with the neonicotinoid thiacloprid in binary mixtures of insecticides with similar modes of action, which showed deviations from the concentration addition model (Loureiro et al. 2010). Mixtures of imidacloprid and thiacloprid displayed synergism in acute exposures antagonism in sublethal exposures whereas imidacloprid and chlorpyrifos demonstrated antagonism in both exposures. Wang et al. (2017) exposed *Danio rerio* to binary through quaternary mixtures of imidacloprid with atrazine, chlorpyrifos, butachlor, and λ cyhalothrin to test the toxic effects on these pesticides that have similar and dissimilar modes of action. All binary mixtures exhibited synergistic effects except imidacloprid with butachlor, which showed antagonism. All ternary mixtures showed synergy except for imidacloprid and chlorpyrifos mixtures that also contained either butachlor or atrazine, which exhibited antagonistic effects. Quaternary mixtures all showed synergism except for imidacloprid-atrazine-chlorpyrifos-butachlor, which showed antagonism, and imidacloprid-atrazine-butachlor-λ cyhalothrin that varied between responses depending on timepoint. Mixture effects on *Danio rerio* of triazophos and imidacloprid were found to be synergistic in an exposure test by Wu et al. 2018. Lanteigne at al. (2015) found that imidacloprid with cyfluthrin resulted in greater-than-additive toxicity toward *Hyalella azteca*.

Two studies were available that showed imidacloprid mixtures to adhere to the concentration addition model. In a study testing the effects of imidacloprid-thiacloprid and imidacloprid-nickel chloride mixtures on *D. magna*, a variety of model deviations were observed depending on endpoint (Pavlaki et al. 2011). Synergism, antagonism, or independent joint action was generally observed except for body length, which fit best to the concentration addition model for thiacloprid mixtures. Maloney et al. (2018) exposed *Chironomus dilutus* to binary mixtures of imidacloprid with neonicotinoids clothianidin

and thiamethoxam where it was shown that mixtures with the former pesticide were predicted by the concentration addition model and mixture with the latter pesticide were best described by the concentration addition model amended with a dose-response parameter.

The methodology requires that each pesticide considered in an accepted mixture model must have a numeric water quality criterion. Water quality criteria for thiacloprid, clothianidin, and thiamethoxam do not exist and therefore these mixture effects will not be considered for criteria compliance.

9.3 Temperature, pH, and other water quality effects

Temperature, pH, and other water quality effects on the toxicity of imidacloprid were examined to determine if any effects are described well enough in the literature to incorporate into criteria compliance (section 3-5.3, TenBrook et al. 2009a). There were no highly rated studies available testing the effects of temperature or pH on imidacloprid. As imidacloprid does not readily dissociate (PPDB 2016), pH is not expected to have a significant effect on the chemical structure in the range of conditions found in natural freshwater environments.

Sanchez-Bayo et al. (2006) studied the effects of ultra violet light on the toxicity of imidacloprid toward *Chyrodus sphaericus*, *Cypretta seuratti*, *Cypridopsis vidua*, *Ilyocypris dentifera*. Light was shown to increase both EC_{50} and LC_{50} values by a factor of two. This reduced toxicity was assumed to be a result of pesticide photodegradation. Indeed, Table 2 shows that the photolytic half-life of imidacloprid ranges from 0.72-24.2 hours. Until more data is available for additional species, the effect of simulated daylight on the toxicity of imidacloprid cannot be considered for compliance.

10 Comparison of ecotoxicity data to derived criteria

10.1 Sensitive species

The derived criteria were compared to toxicity values for the most sensitive species in both the acceptable (RR) and supplemental (RL, LR, LL) data sets to ensure that these species will be adequately protected (section 3-6.1, TenBrook et al. 2009a).

The lowest acute value in the data sets rated RR, RL, LR, or LL (Tables 3, 4, and 5) was the MATC for growth of 0.91 µg/L for the midge *Chironomus tentans*. This study rated RR but was reduced from the dataset due to the endpoint being non-standard for acute tests. The next lowest acute value rated RR, RL, LR, or LL was 1 µg/L for the ostracod, *Cypretta seuratti* (Sanchez-Bayo and Goka 2006). This study rated RR but was performed under non-standard test conditions in total darkness. The derived acute criterion (0.17 µg/L) appears to be protective of all sensitive species in the data sets.

The chronic animal data set shows that aquatic animals are more sensitive to imidacloprid than plants. The chronic criterion was calculated to be protective of animals (16 ng/L) and is several orders of magnitude lower than the single chronic plant MATC of 8,570 µg/L for *Lemna gibba* (Banman et al. 2011). It is more than a factor of seventeen

lower than the lowest chronic animal MATC of 0.0905 µg/L for *Gammarus pulex* (Hendel 2001). Adequate protection will be attained for these sensitive species.

10.2 Ecosystem and other studies

The derived criteria are compared to acceptable laboratory, field, or semi-field multispecies studies (rated R or L) to determine if the criteria will be protective of ecosystems (section 3-6.2, TenBrook et al. 2009a).

The derived criteria are compared to acceptable laboratory, field, or semi-field multispecies studies (rated R or L) to determine if the criteria will be protective of ecosystems (section 3-6.2, TenBrook et al. 2009). Two studies describing effects of imidacloprid on mesocosm, microcosm and model ecosystems were identified and rated for reliability according to the UCDM (Table 3.9, TenBrook et al. 2009a). One study was rated as reliable (R; Moring et al. 1992) and is described below. Two studies rated as not reliable (N) and are not discussed in this report (Colombo et al. 2013; Bottger et al. 2013).

Moring et al. (1992) studied five concentrations of imidacloprid in freshwater outdoor mesocosms seeded with local pond sediment and associated fauna and filled with pond water (evaporated water was replaced with well water). *H. azteca* were introduced from local ponds as the predominant species. Minimal negative impacts were detected on only a small number of taxa, resulting in a NOEC of 6 µg/L. This value is more 1,000 times the chronic criterion and 10 times the acute criterion for imidacloprid. Toxicity values for individual species or the community were not reported.

10.3 Threatened and endangered species

The derived criteria are compared to measured toxicity values for threatened and endangered species (TES), as well as to predicted toxicity values for TES, to ensure that they will be protective of these species (section 3-6.3, TenBrook et al. 2009a). Current lists of state and federally listed threatened and endangered plant and animal species in California were obtained from the California Department of Fish and Game website (CDFG 2015). One listed animal species is represented in the dataset with two toxicity values. Five Evolutionarily Significant Units of *Oncorhynchus mykiss* are listed as federally threatened or endangered throughout California. A highly rated acute study reported a 96 hour LC_{50} of 211,000 µg/L for *O. mykiss* (Grau, no date). The same study reported less sensitive LC_{50} values for different timepoints. Bowman 1990 reported a LC_{50} of >83,000 µg/L. These data indicate that the acute criterion of 0.17 µg/L would be protective of this species.

The USEPA interspecies correlation estimation (Web-ICE v. 3.2.1; Raimondo et al. 2013) software was used to estimate toxicity values for the listed animals or plants represented in the acute data set by members of the same family or genus. Table 11 summarizes the results of the ICE analyses. The estimated toxicity values in Table 11 range from 254,140.98 µg/L for Sockeye salmon, 186,440.92 µg/L for Chinook salmon, 145,836.35 µg/L for Coho salmon, 220,742.14 µg/L for Cutthroat salmon, and 121,480.14 µg/L for Apache trout. The acute criterion was noted to be out of range of the x-axis of the model for all of these salmonid species except for Coho salmon.

No plant studies used in the criteria derivation were of state or federal endangered, threatened or rare species. There are no aquatic plants listed as state or federal endangered, threatened or rare species so they could not be considered in this section.

Based on the available data and estimated values for animals, there is no evidence that the value referenced in place of a calculated acute and or the calculated chronic criteria will be underprotective of threatened and endangered species.

11 Harmonization with other environmental media

11.1 Bioaccumulation

Bioaccumulation was assessed to ensure that the derived criteria will not lead to unacceptable levels of imidacloprid in food items (section 3-7.1, TenBrook et al. 2009a). Imidacloprid has a log K_{ow} of 0.57 (Section 3), a K_d of 1.004-2.253 depending on soil type (Cox et al. 1998b), and a molecular weight of 255.61, which does not indicate a strong bioaccumulative potential. There are no FDA action levels for imidacloprid in food (USFDA 2000), however, the EPA has established pesticide tolerances for residues of imidacloprid and any of its metabolites that contain the 6-chloropyridinyl moiety. For fish, shellfish, and mollusk species the pesticide tolerance is set to 0.05 ppm or 0.05 mg/L or 50 µg/L (USEPA 2013). Bioconcentration of imidacloprid has been measured by several researchers (Table 1).

To check that these criteria are protective of humans that may consume aquatic organisms, a bioaccumulation factor (BAF) was used to estimate the water concentration that would roughly equate to a reported tolerance for residues in food of aquatic origin for humans (pesticide tolerance, $_{human}$). These calculations are further described in section 3-7.1 of the methodology (TenBrook et al. 2009a). The BAF of a given chemical is the product of the BCF and a biomagnification factor (BMF), such that BAF=BCF*BMF. No BMF value was found for imidacloprid. The EPA has set pesticide tolerances for fish, mollusks, and shellfish at 0.05 ppm, which equates to mg/kg (USEPA 2013). A BCF of 0.8 L/kg (EPA 2015, Ding 2004, and Iturburu 2017) was used as an example estimation of bioaccumulation in the environment. No BMF value was available in the literature so it was estimated two ways according to the methodology (a value of 1 both when as approximated from log K_{ow} and as approximated from BCF as in section 3-7.1 and Table 3.15 in TenBrook et al. 2009a).

$$NOEC_{water} = \frac{Pesticide\ tolerance_{human}}{BCF_{food\_item} \cdot BMF_{food\_item}}$$

Human:

$$NOEC_{water} = \frac{0.05\ ^{mg}/_{kg}}{0.8\ ^{L}/_{kg} * 1} = 0.06\ ^{mg}/_{L} = 60\ ^{\mu g}/_{L}$$

In this example, the calculated chronic criterion (16 ng/L or 0.016 μg/L) is three orders of magnitude below the estimated $NOEC_{water}$ value for humans and is not expected to cause adverse effects due to bioaccumulation.

To check that these criteria are protective of terrestrial wildlife that may consume aquatic organisms, a bioaccumulation factor (BAF) was used to estimate the water concentration that would roughly equate to a reported toxicity value for such terrestrial wildlife ($NOEC_{, oral\ predator}$). These calculations are further described in section 3-7.1 of the methodology (TenBrook et al. 2009a). The BAF of a given chemical is the product of the BCF and a biomagnification factor (BMF), such that BAF=BCF*BMF. No BMF value was found for imidacloprid. Chronic dietary toxicity values are preferred for this calculation. There were 2 highly rated studies available for *Anus platyrhynchos* that reported NOEC values. A study by Hancock (1994) determined a NOEC of 47 mg/kg. Toll reported a NOEC of 125 mg/kg (1991). The geometric mean of these NOEC values was 77 mg/kg. A BCF of 0.8 L/kg (EPA 2015, Ding 2004, and Iturburu 2017) was used as an example estimation of bioaccumulation in the environment. No BMF value was available in the literature so it was estimated two ways according to the methodology (a value of 1 both when as approximated from log K_{ow} and as approximated from BCF as in section 3-7.1 and Table 3.15 in TenBrook et al. 2009a).

$$NOEC_{water} = \frac{NOEC_{oral\ predator}}{BCF_{food\ item} \cdot BMF_{food\ item}}$$

Mallard: $$NOEC_{water} = \frac{77\ ^{mg}/_{kg}}{0.8^{L}/_{kg} * 1} = 96\ ^{mg}/_{L} = 96{,}000\ ^{\mu g}/_{L}$$

In this example, the calculated chronic criterion (16 ng/L or 0.016 μg/L) is seven orders of magnitude below the estimated $NOEC_{water}$ value for wildlife and is not expected to cause adverse effects due to bioaccumulation.

11.2 Harmonization with air and sediment criteria

This section addresses how the maximum allowable concentration of imidacloprid might impact life in other environmental compartments through partitioning (section 3-7.2, TenBrook et al. 2009a). There were no sediment studies available for imidacloprid. Imidacloprid is listed as a hazardous air pollutant and toxic air contaminant by the California Air Resources Board (CCR 2016) although a reference concentration for chronic inhalation exposure is not available (IRIS 1989). There are no other federal or state sediment or air quality standards for imidacloprid (CARB 2008; CDWR 1995), nor is imidacloprid mentioned in the NOAA sediment quality guidelines (NOAA 1999). For biota, the limited data on bioconcentration or biomagnification of imidacloprid is addressed in section 15.

12 Imidacloprid criteria summary

12.1 Limitations, assumptions, and uncertainties

The assumptions, limitations and uncertainties involved in criteria generation are available to inform environmental managers of the accuracy and confidence in criteria (section 3-8.0, TenBrook et al. 2009a). Chapter 2 of the methodology (TenBrook et al. 2009a) discusses these points for each section as different procedures were chosen, such as the list of assumptions associated with using an SSD (section 2-3.1.5.1), and reviews them in section 2-7.0. This section summarizes any data limitations that affected the procedure used to determine the final imidacloprid criteria.

Overall, there was a lack a highly rated aquatic plant and animal toxicity data for imidacloprid. Both the acute and chronic data sets lacked the full complement of five required taxa to fit a distribution for criteria derivation. The acute and chronic data sets were missing values for warm water fish. The AF procedure was used to calculate the acute criterion. ACR calculations were used to determine the chronic criterion. The chronic criterion was derived with a minimum amount of data according to the methodology (section 3-4.2.3, TenBrook et al. 2009a) using three highly rated SMACRs and one default ACR value. Plant studies are always considered chronic (Section 3-2.1.1.1, TenBrook et al. 2009a) and therefore could not be used in the ACR calculations because there was no associated acute data. As a result, the chronic criterion does not incorporate plant toxicity.

Other limitations include the lack of sediment, bioavailability, and wildlife studies. There were no sediment or bioavailability studies available although imidacloprid has a high solubility and therefore retention on sediment surfaces is not expected to be significant. Additional high-quality mallard duck studies could be useful although the demonstrated lack of definitive toxicity values indicates that this species is not sensitive to imidacloprid.

Acute mortality as an endpoint to estimate imidacloprid toxicity for aquatic invertebrates has been shown to be less realistic than immobility endpoints. Delayed mortality is a concern for invertebrates exposed to neonicotinoids such as imidacloprid (Pisa et al., 2017). This effect occurs slowly over time as an organism's nicotinic acetylcholine receptors become irreversibly saturated with the pesticide, even at low pesticide concentrations. Neural regeneration does not occur so the organism eventually dies. Acute mortality toxicity values for short exposures are not realistic measures of toxicity for aquatic invertebrates because it is chronic, low-level exposures that affect organism survival. Additional consideration should be given to residual concentrations in the environment that cause organisms to be exposed constantly or repeatedly.

It should be noted that mortality may not be the most reliable endpoint for imidacloprid toxicity in aquatic invertebrates. One research team (Raby et al. 2018a) hypothesized that previous studies reporting mortality may have done so incorrectly because visual inspection methods can label organisms as deceased when they are actually immobilized. The argument is made that the inspection method typically used is insufficient to observe that an organism is alive but immobilized (i.e., presence of a heartbeat and movement of microscopic appendage can be observed under a microscope). Raby's team argues that microscope observations are required for accurate mortality and

immobility determinations. Immobilization occurs at lower concentrations whereas actual mortality with no heartbeat detected under a microscope occurs at higher concentrations. Therefore, some historical LC50 values may actually be EC50 values.

The criteria in this report are based partially on mortality endpoints. The acute criterion is based on immobility whereas the chronic criterion calculation utilizes four experimental values based on mortality, immobilization, growth, and reproduction. The UC-Davis methodology requires either immobility or mortality toxicity values for calculation of acute criteria, so if some tests organisms were identified as dead, but were actually only immobile, the resulting toxicity values would still be used in criteria calculation, thus the criteria would not be adjusted based on this information.

12.2 Comparison to national standard methods

This section is provided as a comparison between the UC-Davis methodology for criteria calculation (TenBrook et al. 2009a) and the current USEPA (1985) national standard. The following example imidacloprid criteria were generated using the USEPA (1985) methodology with the data set generated in this imidacloprid criteria report.

The USEPA acute methods have three additional taxa requirements beyond the five required by the SSD procedure of the UC-Davis methodology (section 3-3.1, TenBrook et al. 2009a). They are:

1. A third family in the phylum Chordata (e.g., fish, amphibian);
2. A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca);
3. A family in any order of insect or any phylum not already represented.

The first additional requirement could be met with *Pelophylax nigromaculatus* in the Ranidae family. *Trichocorixa* in the Corixidae family could satisfy the second additional requirement. The third additional requirement could be met by *Lumbriculus variegatus* in the Annelida phylum. However, because data for a warm water fish was not available for either method, no acute criterion could be calculated according to the USEPA (1985) methodology.

According to the USEPA (1985) methodology, the chronic criterion is equal to the lowest of the Final Chronic Value, the Final Plant Value, and the Final Residue Value.

To calculate the Final Chronic Value, animal data are used and the same taxa requirements must be met as in the calculation of the acute criterion (section III B USEPA 1985). Only four of the eight taxa requirements are available in the RR chronic animal data set with *Chironomus riparius, Daphnia magna*, *Gammarus pulex,* and *Oncorhynchus mykiss*. (Table 7). The missing taxa are as follows:

1. A warm water fish
2. A third family in the phylum Chordata (e.g., fish, amphibian)
3. A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca)
4. A family in any order of insect or any phylum not already represented

The California Department of Fish and Game has derived criteria using the USEPA (1985) SSD method with fewer than the eight required families, using professional judgment to determine that species in the missing categories were relatively insensitive and their addition would not lower the criteria (Menconi & Beckman 1996; Siepmann & Jones 1998). In this case, there are too many missing taxa values to derive a Final Chronic Value in this way.

The Final Plant Value is calculated as the lowest result from a 96 hour test conducted with an important plant species in which the concentrations of test material were measured and the endpoint was biologically important. The single plant toxicity value in the RR data set (Table 6) is not for a 96 hour test but rather 7 days or 168 hours. That reported NOEC is 5,830 μg/L for *Lemna gibba* (Banman et al. 2011) to serve as the chronic criterion.

Final Plant Value = lowest result from a plant test
= 5,830 μg/L

The Final Residue Value is calculated by dividing the maximum permissible tissue concentration by an appropriate bioconcentration or bioaccumulation factor. A maximum allowable tissue concentration is either (a) a FDA action level for fish oil or for the edible portion of fish or shellfish, or (b) a maximum acceptable dietary intake based on observations on survival, growth, or reproduction in a chronic wildlife feeding study or long-term wildlife field study. There are no FDA action levels for imidacloprid in food (USFDA 2000), however, the EPA has established pesticide tolerances for imidacloprid fish, shellfish, and mollusk species at 0.05 ppm (USEPA 2013). There were 2 highly rated studies that report NOEC values available for wildlife that result in a geometric mean of 77 mg/kg. A BCF of 0.57 (Table 1) was used to calculate the Final Residue Value.

$\text{Final Residue Value}_{\text{human}}$ = maximum acceptable dietary intake ÷ BCF
= 0.05 mg/kg ÷ 0.57 L/kg
= 0.088 mg/L
= 88 μg/L

$\text{Final Residue Value}_{\text{wildlife}}$ = maximum acceptable dietary intake ÷ BCF
= 77 mg/kg ÷ 0.57 L/kg
= 135 mg/L
= 135,000 μg/L

A Final Chronic Value cannot be calculated. The Final Plant Value is lower than the Final Residue Value for wildlife. The Final Residue Value for humans is the lowest value and therefore the chronic criterion by the USEPA (1985) methodology for imidacloprid would be 88 μg/L. The example chronic criterion is three orders of magnitude higher than the one recommended by the UC-Davis methodology.

12.3 Environmental Monitoring Data

A review of the available data from the Surface Water Database (SURF 2017) indicates that imidacloprid and some of its metabolities have been present in some freshwater systems within the Central Coast Regional Water Quality Control Board jurisdiction. Its geographic area encompasses some or all of nine counties. The data for the following counties was included in the SURF data anaylsis for this report because they fully reside within this waterboard's jurisdiction: Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara. Data was available for 2010-2017.

Imidacloprid concentrations were reported for 309 samples between 2010-2017. The values ranged from 0.0357 to 9.14 parts per billion (ppb, equivalent to µg/L) in Santa Barbara and San Luis Obispo Counties, respectively. Two hundred ninety-five detections were greater than the acute criteria, ranging from 1 to 130 times the acute value. All detections were greater than the chronic criteria, by factors ranging from 2.6 to 652. Average concentations by county are Santa Cruz: 0.06, Monterey: 0.74, San Luis Obispo: 0.38, Santa Barbara: 1.57 ppm. San Benito reported no detections.

Imidacloprid guanidine values were reported for 2012 only. There were 25 samples in Monterery County that ranged from 0.054 to 0.291 ppb. Only two samples fell below the imidacloprid acute criterion and all were greater than the imidacloprid chronic criterion by factors ranging from 4 to 21. One sample was reported for San Luis Obispo County at 0.078 ppb. This was 0.008 greater than the acute criterion and 5 times greater than the chronic criterion. Four detections were reported in Santa Barbara County between 0.0529 (below the acute criteria) and 0.135 (twice acute criteria), all greater than the chronic criteria by factors of 4 to 10.

The imidacloprid urea metabolite was detected in one sample each in 2012 in Monterery and Santa Barbara Counties at 0.051 and 0.0582 ppb, respectively. These values are lower than the acute criterion but more than three times greater than the chronic criterion.

There were no detections reported for the metabolites imidacloprid guanidine olefin or imidacloprid olefin.

The reported method detection limits (MDL) for these imidacloprid species have varied over time from 0.0038 to 0.0394 ppb, which has always been below the acute criterion but not always below the chronic criterion.

12.4 Final criteria statement

<u>Final calculated criteria for imidacloprid</u>:

- Acute criterion = 0.17 µg/L
- Chronic criterion = 0.016 µg/L = 16 ng/L

Aquatic life in the watersheds of the Central Coast Regional Water Quality Control Board (CCRWQCB) should not be affected unacceptably if the four-day average concentration of imidacloprid does not exceed 16 ng/L more than once every three years on the average and if the one-hour average concentration does not exceed 0.17 µg/L more than once every three years on the average.

Details of the chronic criterion calculation are described in section 8 and chronic plant datum is shown in Table 6. The chronic criterion was calculated using animal data

by the ACR method because there was insufficient data for use of a SSD for criterion calculation.

Application:

Although the criteria were derived to be protective of aquatic life in the watersheds of the CCRWQCB, these criteria would be appropriate for any freshwater ecosystem in North America, unless species more sensitive than are represented by the species examined in the development of these criteria are likely to occur in those ecosystems.

Comparisons to other aquatic criteria:

There are no established water quality criteria for imidacloprid with which to compare the criteria derived in this report. The USEPA has several aquatic life benchmarks established for imidacloprid, shown in Table 12, to which the derived criteria in this report can be compared with caution (USEPA 2014). According to the USEPA (2014), aquatic life benchmarks are not calculated following the same methodology used to calculate water quality criteria. Water quality criteria can be used to set water quality standards under the Clean Water Act, but aquatic life benchmarks may not be used for this purpose (USEPA 2014).

The referenced acute value in this report is below both the acute fish benchmark by more than 6 orders of magnitude and the acute invertebrate benchmark by a factor of 2.3 (Table 12). The derived chronic criterion of this report is well below the chronic benchmarks for fish and acute nonvascular plants (both by 6 orders of magnitude). The chronic criterion of this report is 0.006 µg/L greater than the chronic benchmark value for invertebrates. It is worth noting that the USEPA chronic invertebrate benchmark is based on a NOEC from a mesocosm study (Roessink et al., 2013), which utilized an imidacloprid formulation. The UCD methodology favors the use of high purity material. Additionally, the UCD method uses MATC values rather than NOEC values because NOEC values are overly conservative. Thus, it is not recommended to adjust the chronic criterion downward based on this study.

Acknowledgements

Special thanks to Water Board staff for valuable input, editing assistance, and the opportunity to research the effect of imidacloprid on the aquatic environment: Peter Meertens, Mary Hamilton, Daniel McClure, and Tessa Fojut, Ph.D.

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Data Tables

Table 3 Final acute toxicity data set for Imidacloprid.

All studies were rated RR and were conducted at standard temperature. S: static; SR: static renewal; FT: flow-through; Nom: nominal; Meas: measured; Corr: corrected

Species	Common Identifier	Family	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/ size	LC/EC50 (µg/L) (95% CI)	Reference
Aedes sp.	Mosquito	Culicidae	S	Corr	99.90%	48 h	13.8	Mortality	Larvae	40.8 (27.9–53.6)	Raby 2018c
Caecidotea sp.	Isopod	Asellidae	S	Corr	99.90%	96 h	14	Immobility	Adult	320.8 (162.0–479.6)	Raby 2018a
Ceriodaphnia dubia	Daphnid	Daphniidae	SR	Corr	99.80%	6 d	25	Immobility	< 24 h	2,980 (2,590-3,370)	Raby 2018b
Cheumatopsyche sp.	Caddisfly	Hydropsychidae	S	Corr	99.90%	96 h	15	Immobility	Nymph	176.4 (99.7–253.1)	Raby 2018a
Chironomus dilutus	Midge	Chironomidae	S	Corr	99.90%	96 h	22	Immobility	Third instar	2.5 (2.1-2.8)	Raby 2018a
Chydorus sphaericus	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Light: 132,673 (68,426–257,240)	Sanchez-Bayo and Goka 2006
Cloeon sp.	Mayfly	Baetidae	S	Corr	99.90%	96 h	15	Immobility	Nymph	23.1 (16.2–33.2)	Raby 2018a
Coenagrion sp.	Damselfly	Coenagrionidae	S	Corr	99.90%	96 h	14	Mortality	Nymph	3,462.7 (2,046.6–8,972.0)	Raby 2018a
Cypretta seuratti	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Light: 16 (7–39)	Sanchez-Bayo and Goka 2006
Cypridopsis vidua	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Light: 3 (0.5–15),	Sanchez-Bayo and Goka 2006

Daphnia magna	Daphnid	Daphniidae	SR	NR	97.00%	48 h	21	Immobility	<24 h	16,500 (12,760-21,820)	Qi 2018
Daphnia magna	Daphnid	Daphniidae	S	Meas	95.90%	48 h	20	Immobility	<24 h	85,000 (71,000-113,000)	Young 1990a
Daphnia magna	Daphnid	Daphniidae	NR	NR	99.50%	48 h	22	Immobility	24 h	6,029 (332–109,433)	Sanchez-Bayo and Goka 2006
										20373	GEOMEAN
Ephemerella sp.	Mayfly	Ephemerellidae	S	Corr	99.90%	96 h	15	Immobility	Nymph	10.6 (7.5–15.0)	Raby 2018a
Fejervarya limnocharis	Asian grass frog	Dicroglossidae	SR	NR	95.00%	96 h	20	Mortality	Tadpole	82,000 (70,000-96,000)	Feng 2004
Gyrinus sp.	Water beetle	Gyrinidae	S	Corr	99.90%	96 h	15	Immobility	Adult	57.5 (40.5–74.5)	Raby 2018a
Hyalella azteca	Amphipod	Hyalellidae	S	Corr	99.90%	96 h	22	Immobility	2-9 d old, within 2 d of each other	176.9 (149.4–204.4)	Raby 2018a
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	96 h	20	Immobility	2-3 mm	55 (34-93)	England 1991
										98.6	GEOMEAN
Isonychiidae bicolor	Mayfly	Isonychiidae	S	Corr	99.90%	96 h	15	Immobility	Nymph	60.4 (43.2–77.7)	Raby 2018a
Ilyocypris dentifera	Ostracod	Ilyocyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Light: 3 (1–11),	Sanchez-Bayo and Goka 2006
Lumbriculus variegatus	Blackworm	Lumbriculidae	S	Corr	99.90%	96 h	22	Immobility	7 d	32.4 (26.7–38.0)	Raby 2018a

***McCaffertium* sp.**	**Mayfly**	**Heptageniidae**	**S**	**Corr**	**99.90%**	**96 h**	**15**	**Immobility**	**Nymph**	**10.6 (7.5–15.0)**	**Raby 2018a**
***Micrasema* sp.**	**Caddisfly**	**Brachycentridae**	**S**	**Corr**	**99.90%**	**96 h**	**15**	**Mortality**	**Nymph**	**14.6 (11.0–18.2)**	**Raby 2018a**
Neocloeon triangulifer	**Mayfly**	**Baetidae**	**S**	**Corr**	**99.90%**	**96 h**	**24**	**Immobility**	**<24 h**	**3.1 (2.6–3.7)**	**Raby 2018a**
Oncorhynchus mykiss	**Rainbow trout**	**Salmonidae**	**S**	**Nom**	**95.30%**	**96 h**	**15**	**Mortality**	**1.3 g**	**211,000 (158,000-281,000)**	**Grau 1988**
Pelophylax nigromaculatus	**Dark-spotted frog**	**Ranidae**	**SR**	**NR**	**95.00%**	**96 h**	**20**	**Mortality**	**Tadpole**	**129,000 (115,000-145,000)**	**Feng 2004**
Simulium vittatum	**Blackfly**	**Simuliidae**	**S**	**Meas**	**>98%**	**48 h**	**20**	**Mortality**	**Fifth instar**	**6.75 (6.04-7.41)**	**Overmeyer 2005**
Simulium vittatum	**Blackfly**	**Simuliidae**	**S**	**Meas**	**>98%**	**48 h**	**20**	**Mortality**	**Fifth instar**	**8.25 (7.56-8.87)**	**Overmeyer 2005**
Simulium vittatum	**Blackfly**	**Simuliidae**	**S**	**Meas**	**>98%**	**48 h**	**20**	**Mortality**	**Fifth instar**	**9.54 (8.71-10.57)**	**Overmeyer 2005**
										8.10	**GEOMEAN**
Trichocorixa	**Water boatman**	**Corixidae**	**S**	**Corr**	**99.90%**	**48 h**	**15**	**Immobility**	**Adult**	**63.1 (44.6–89.2)**	**Raby 2018a**

*Confidence interval not reported

Table 4 Acceptable reduced acute data rated RR with given reason for exclusion.

S: static; SR: static renewal; FT: flow-through; Nom: nominal; Meas: measured; Corr: corrected

Species	Common Identifier	Family	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/size	LC/EC_{50} (µg/L) (95% CI)	Reference	Reason
Chironomus dilutus	Midge	Chironomidae	S	NR	98.80%	96 h	23	Mortality	6-7 d	4.63 (3.96-5.41)	Maloney 2017	A
Chironomus dilutus	Midge	Chironomidae	S	Corr	99.90%	96 h	22	Mortality	Third instar	11.8 (8.3-15.4)	Raby 2018a	A
Chironomus riparius	Midge	Chironomidae	S	Meas	99.90%	24 h	20	Mortality	Larvae	31.5 (15.1-75.9)	Naveen 2018	A
Chironomus riparius	Midge	Chironomidae	S	Meas	99.90%	24 h	20	Mortality	Larvae	55.2 (48-63)	Dorgerloh 2002	A
Ceriodaphnia dubia	Water flea	Daphniidae	S	Corr	99.90%	48 h	23	Mortality	<24 h	721,424.9 (51,000-102,000)	Raby 2018a	A
Cheumatopsyche sp.	Caddisfly	Hydropsychidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	324.5 (72.1–576.8)	Raby 2018a	A
Chironomus tentans	Midge	Chironomidae	SR	Meas	95.00%	96 h	22	Growth	Second instar	MATC 0.91	Gagliano 1991	A
Chydorus sphaericus	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Dark: 832 (274-2,522)	Sanchez-Bayo and Goka 2006	A
Chydorus sphaericus	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Mortality	NR	Light: 161,950 (61,050–429,614)	Sanchez-Bayo and Goka 2006	A

Chydorus sphaericus	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Mortality	NR	Light: 132,673 (68,426–257,240)	Sanchez-Bayo and Goka 2006	A
Chydorus sphaericus	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Immobility	NR	Light: 18,683 (10,891–32,050) Dark: 1,469 (250–8,619)	Sanchez-Bayo and Goka 2006	C
Cloeon sp.	Mayfly	Baetidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	1152.0 (513.1–1,790.8)	Raby 2018a	A
Cypretta seuratti	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Mortality	NR	Dark: 1 (0.4-2)	Sanchez-Bayo and Goka 2006	D
Cypretta seuratti	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Mortality	NR	Light: 732 (456–1176)	Sanchez-Bayo and Goka 2006	A
Cypretta seuratti	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Mortality	NR	Light: 301 (187–485)	Sanchez-Bayo and Goka 2006	A
Cypretta seuratti	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Immobility	NR	Light: 46 (13–161) Dark: 12 (5–29)	Sanchez-Bayo and Goka 2006	C
Cypridopsis vidua	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Dark: 273 (54-1,379)	Sanchez-Bayo and Goka 2006	D
Cypridopsis vidua	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Mortality	NR	Dark: 542 (45–6,581)	Sanchez-Bayo and Goka 2006	D

Cypridopsis vidua	Ostracod	Cyprididae	NR	NR	99.50%	48 h	22	Mortality	NR	Light: 715 (365–1,400), Dark: 10 (1.3–73)	Sanchez-Bayo and Goka 2006	A
Cypridopsis vidua	Ostracod	Cyprididae	NR	NR	99.50%	24 h	22	Immobility	NR	Light: 8 (1.3–47), Dark: 16 (1.3–210)	Sanchez-Bayo and Goka 2006	C
Daphnia magna	Water flea	Daphniidae	SR	NR	97.00%	48 h	21	Embryonic hatching rate	<24 h	16,200 (12,310-25,770)	Qi 2018	C
Daphnia magna	Water flea	Daphniidae	NR	NR	99.50%	48 h	22	Mortality	24 h	64,873 (7,871–534,688)	Sanchez-Bayo and Goka 2006	A
Daphnia magna	Water flea	Daphniidae	NR	NR	99.50%	24 h	22	Immobility	24 h	11,822 (464–301,256)	Sanchez-Bayo and Goka 2006	C
Ephemerella sp.	Mayfly	Ephemerellidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	68.2 (33.1–103.3)	Raby 2018a	A
Fejervarya limnocharis	Asian grass frog	Dicroglossidae	SR	NR	95.00%	48 h	20	Mortality	Tadpole	165,000 (141,000-193,000)	Feng 2004	C
Fejervarya limnocharis	Asian grass frog	Dicroglossidae	SR	NR	95.00%	72 h	20	Mortality	Tadpole	116,000 (100,000-135,000)	Feng 2004	C
Fejervarya limnocharis	Asian grass frog	Dicroglossidae	SR	NR	95.00%	24 h	20	Mortality	Tadpole	235,000 (205,000-269,000)	Feng 2004	C
Gyrinus sp.	Water beetle	Gyrinidae	S	Corr	99.90%	96 h	15	Mortality	Adult	132.2 (99.9–164.5)	Raby 2018a	A
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	72 h	20	Immobility	2-3 mm	113 (77-165)	England 1991	C

Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	24 h	20	Immobility	2-3 mm	218 (148-324)	England 1991	C
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	48 h	20	Immobility	2-3 mm	129 (85-193)	England 1991	C
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	72 h	20	Mortality	2-3 mm	1,756 (884-5,448)	England 1991	A
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	Technical	96 h	20	Mortality	2-3 mm	526 (194-1,263)	England 1991	A
Hyalella azteca	Amphipod	Hyalellidae	S	Corr	99.90%	96 h	22	Mortality	2-9 d old, within 2 d of each other	363.2 (301.3–425.1)	Raby 2018a	A
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	83.3-96.9%	48 h	22	Mortality	14-21 d	63,600 (53,900-75,100)	Roney 1996	A
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	83.3-96.9%	72 h	22	Mortality	14-21 d	55,800 (48,200-64,500)	Roney 1996	A
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	83.3-96.9%	96 h	22	Mortality	14-21 d	51,800 (44,000-60,900)	Roney 1996	A
Hexagenia sp.	Mayfly	Ephemeridae	S	Nom	>95%	96 h	NR	Mortality	Nymph	900 (290-2,800)	Bartlett 2018	A
Hexagenia sp.	Mayfly	Ephemeridae	S	Corr	99.90%	96 h	22	Mortality	4-6 mg	93,20.5 (3,757.2–14,883.8)	Raby 2018a	A
Ilyocypris dentifera	Ostracod	Ilyocyprididae	NR	NR	99.50%	24 h	22	Mortality	NR	Light: 1,122 (518–2,432) Dark: 759 (337–1,709)	Sanchez-Bayo and Goka 2006	A

Ilyocypris dentifera	Ostracod	Ilyocyprididae	NR	NR	99.50%	48 h	22	Mortality	NR	Light: 517 (270–989) Dark: 214 (98–463)	Sanchez-Bayo and Goka 2006	A
Ilyocypris dentifera	Ostracod	Ilyocyprididae	NR	NR	99.50%	24 h	22	Immobility	NR	Light: 13 (4–48), Dark: 5 (1–25)	Sanchez-Bayo and Goka 2006	C
Ilyocypris dentifera	Ostracod	Ilyocyprididae	NR	NR	99.50%	48 h	22	Immobility	NR	Dark: 3 (0.2-48)	Sanchez-Bayo and Goka 2006	D
Isonychiidae bicolor	Mayfly	Isonychiidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	715.2 (319.3–1,111.0)	Raby 2018a	A
Lumbriculus variegatus	Blackworm	Lumbriculidae	S	Corr	99.90%	96 h	22	Mortality	7 d	45.4 (30.6–60.1)	Raby 2018a	A
McCaffertium sp.	Mayfly	Heptageniidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	1,810.2 (1,018.2–2,602.3)	Raby 2018a	A
Neocloeon triangulifer	Mayfly	Baetidae	S	Corr	99.90%	96 h	24	Mortality	<24 h	5.2 (4.2–6.2)	Raby 2018a	A
Oncorhynchus mykiss	Rainbow trout	Salmonidae	S	Nom	95.30%	24 h	15	Mortality	1.3 g	265,000 (220,000-320,000)	Grau 1988	A
Oncorhynchus mykiss	Rainbow trout	Salmonidae	S	Nom	95.30%	48 h	15	Mortality	1.3 g	211,000 (158,000-281,000)	Grau 1988	A
Oncorhynchus mykiss	Rainbow trout	Salmonidae	S	Nom	95.30%	72 h	15	Mortality	1.3 g	211,000 (158,000-281,000)	Grau 1988	A
Oncorhynchus mykiss	Rainbow trout	Salmonidae	S	Meas	95.00%	96 h	13	Mortality	1.07 g	>83,000	Bowman 1990b	B

Pelophylax nigromaculatus	Dark-spotted frog	Ranidae	SR	NR	95.00%	24 h	20	Mortality	Tadpole	268,000 (226,000-318,000)	Feng 2004	C
Pelophylax nigromaculatus	Dark-spotted frog	Ranidae	SR	NR	95.00%	48 h	20	Mortality	Tadpole	219,000 (153,000-313,000)	Feng 2004	C
Pelophylax nigromaculatus	Dark-spotted frog	Ranidae	SR	NR	95.00%	72 h	20	Mortality	Tadpole	177,000 (160,000-200,000)	Feng 2004	C
Trichocorixa	Water boatman	Corixidae	S	Corr	99.90%	48 h	15	Mortality	Adult	450.4 (274.0–626.7)	Raby 2018a	A

*Confidence interval not reported

Reduction Reasons

A. Less sensitive endpoint

B. Inexact toxicity value

C. Longer duration preferred

D. Non-standard test conditions

Table 5 Supplemental acute data rated RL, LR, LL with given reason for rating and exclusion.

S: static; SR: static renewal; FT: flow-through. NR: not reported; Corr: corrected; 95% CI: 95% confidence interval. Exclusion reasons are listed at the end of the table. **Green: metabolite, 6-chloronicotinic acid; Blue: metabolite, imidaclopid urea, NTN 33519**

Species	Common Identifier	Family	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/ size	LC/EC_{50} (µg/L) (95% CI)	Reference	Reason
Baetis rhoadani	Mayfly	Baetidae	S	NR	Analytical	48 h	15	Mortality	NR	8.49 (4.45–16.20)	Beketov 2008	6
Caenis sp.	Mayfly	Caenidae	S	Corr	99.90%	96 h	15	Mortality	Nymph	<21.8	Raby 2018a	4
Caenis sp.	Mayfly	Caenidae	S	Corr	99.90%	96 h	15	Immobility	Nymph	<21.8	Raby 2018a	4
Cheumatopsyche brevilineata	Caddisfly	Hydropsychidae	S	NR	Analytical	48 h	20	Immobility	First instar, strain M	6.64*	Yokoyama 2009	5, 6
Cheumatopsyche brevilineata	Caddisfly	Hydropsychidae	S	NR	Analytical	48 h	20	Immobility	Fifth instar, strain M	37.9*	Yokoyama 2009	5, 6
Cheumatopsyche brevilineata	Caddisfly	Hydropsychidae	S	NR	Analytical	48 h	20	Immobility	First instar, strain K	6.54*	Yokoyama 2009	5, 6
Cheumatopsyche brevilineata	Caddisfly	Hydropsychidae	S	NR	Analytical	48 h	20	Immobility	Fiftt instar, strain K	33.3*	Yokoyama 2009	5, 6
Cyprinodon variegatus	Sheepshead minnow	Cyprinodontidae	S	Meas	96.20%	24 h	21	Mortality	29 mm	>195,000	Ward 1990	2

Cyprinodon variegatus	Sheepshead minnow	Cyprinodontidae	S	Meas	96.20%	48 h	21	Mortality	29 mm	169,000 (105,000-∞)	Ward 1990	2
Cyprinodon variegatus	Sheepshead minnow	Cyprinodontidae	S	Meas	96.20%	72 h	21	Mortality	29 mm	161,000 (105,000-∞)	Ward 1990	2
Cyprinodon variegatus	Sheepshead minnow	Cyprinodontidae	S	Meas	96.20%	96 h	21	Mortality	29 mm	161,000 (105,000-∞)	Ward 1990	2
Crassostrea virginica	Eastern oyster	Ostreidae	FT	Meas	96.20%	96 h	21	Shell growth	0.21-0.41 g	>145,000	Wheat 1991	4
Crassostrea virginica	Eastern oyster	Ostreidae	FT	Meas	96.20%	96 h	21	Shell growth	0.21-0.41 g	>23,300	Wheat 1991	4
Daphnia magna	Water flea	Daphniidae	S	NR	Analytical	24 h	21	Immobility	<24 h	97,900 (81,400-127,700)	Tisler 2009	3
Daphnia magna	Water flea	Daphniidae	S	NR	Analytical	48 h	21	Immobility	<24 h	56,600 (34,400-77,200)	Tisler 2009	3
Daphnia magna	Water flea	Daphniidae	S	Corr	99.90%	48 h	21	Mortality	<24 h	>102,000	Raby 2018a	7
Danio rerio	Zebra fish	Cyprinidae	S	NR	Analytical	48 h	26	Mortality	Embryo	NR	Tisler 2009	4, 5, 6
Danio rerio	Zebra fish	Cyprinidae	S	NR	Analytical	96 h	21	Mortality	NR	241,000 (224,000-257,000)	Tisler 2009	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	48 h	26	Mortality	Larvae	186,900 (134,500-325,100)	Wang 2017	6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	96 h	26	Mortality	Larvae	143,700 (99,980-221,600)	Wang 2017	6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	24 h	26	Mortality	Embryo	433,900 (238,700-584,300)	Wu 2018	5, 6

Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	48 h	26	Mortality	Embryo	352,100 (157,600-492,700)	Wu 2018	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	72 h	26	Mortality	Embryo	150,900 (72,400-264,800)	Wu 2018	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	96 h	26	Mortality	Embryo	121,600 (80,210-127,900)	Wu 2018	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	96 h	26	Mortality	Larvae	128,900 (88,470-173,600)	Wu 2018	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	96 h	26	Mortality	Juvenile	26,390 (19,04-38,010)	Wu 2018	5, 6
Danio rerio	Zebra fish	Cyprinidae	SR	NR	95.30%	96 h	26	Mortality	Adult	76,080 (49,250-106,900)	Wu 2018	5, 6
Gammarus fossarum	Gammarid	Gammaridae	S	Nom	99.80%	24 h	15	Immobility	Adult male	NR	Malev 2012	4
Gammarus pulex	Gammarid	Gammaridae	SR	NR	99.00%	34 h	13	Feeding rate	3.8-15.0 mg dry wt	18.96 (14.93-23.05)	Agatz 2014	7
Gammarus pulex	Gammarid	Gammaridae	SR	NR	99.00%	48 h	13	Feeding rate	3.8-15.0 mg dry wt	20.59 (6.48-72.01)	Agatz 2014	7
Gammarus pulex	Gammarid	Gammaridae	SR	NR	99.00%	72 h	13	Feeding rate	3.8-15.0 mg dry wt	10.50*	Agatz 2014	7
Gammarus pulex	Gammarid	Gammaridae	SR	NR	99.00%	96 h	13	Feeding rate	3.8-15.0 mg dry wt	5.34*	Agatz 2014	7

Hexagenia sp.	Mayfly	Ephemeridae	S	Nom	>95%	96 h	NR	Abnormal behavior	Nymph	10 (2.5-42)	Bartlett 2018	7
Hyalella Azteca	Amphipod	Hyalellidae	S	Meas	83.3-96.9%	96 h	22	Abnormal behavior	14-21 d	29,000 (24,700-34,000)	Roney 1996	7
Isonychia bicolor	Mayfly	Isonychiidae	S	Nom	99.90%	96 h	15	Mortality	Larvae	18.77*	Camp 2016	1, 6
Lepomis macrochirus	Bluegill	Centrarchidae	S	Meas	95.00%	96 h	22	Mortality	0.46 g	>105,000	Bowman 1990a	4
Lepomis macrochirus	Bluegill	Centrarchidae	S	Meas	95.00%	96 h	22	Abnormal behavior	0.46 g	25,000	Bowman 1990a	7
Marsupenaeus japonicus	Decapod	Penaeidae	SR	NR	93.50%	24 h	23	Mortality	0.374 g	0.866*	Nosaka 1990a	1, 2, 6
Marsupenaeus japonicus	Decapod	Penaeidae	SR	NR	93.50%	48 h	23	Mortality	0.374 g	0.459 (0.229-0.908)	Nosaka 1990a	1, 2, 6
Marsupenaeus japonicus	Decapod	Penaeidae	SR	NR	93.50%	72 h	23	Mortality	0.374 g	0.310 (0.152-0.610)	Nosaka 1990a	1, 2, 6
Marsupenaeus japonicus	Decapod	Penaeidae	SR	NR	93.50%	96 h	23	Mortality	0.374 g	0.225 (0.119-0.420)	Nosaka 1990a	1, 2, 6
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	24 h	21	Mortality	<24 h	>249	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	48 h	21	Mortality	<24 h	76.6 (63.0-90.6)	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	72 h	21	Mortality	<24 h	58.3 (49.9-68.5)	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	96 h	21	Mortality	<24 h	37.7 (25.7-46.4)	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	24 h	23	Mortality	<24 h	38.1 (32.4-45.5)	Ward 1990	2

Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	48 h	23	Mortality	<24 h	34.5 (30.2-39.6)	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	72 h	23	Mortality	<24 h	33.7 (29.5-38.6)	Ward 1990	2
Mysidopsis bahia	Mysid	Mysidae	FT	Meas	96.20%	96 h	23	Mortality	<24 h	34.1 (22.9-37.2)	Ward 1990	2
Palaemon paucidens	Striped prawn	Palaemonidae	SR	NR	93.50%	24 h	23	Mortality	0.291 g	49.2 (25.9-98.6)	Nosaka 1990b	1, 6
Palaemon paucidens	Striped prawn	Palaemonidae	SR	NR	93.50%	48 h	23	Mortality	0.291 g	26.3 (13.9-71.1)	Nosaka 1990b	1, 6
Palaemon paucidens	Striped prawn	Palaemonidae	SR	NR	93.50%	72 h	23	Mortality	0.291 g	23.1 (11.9-63.0)	Nosaka 1990b	1, 6
Palaemon paucidens	Striped prawn	Palaemonidae	SR	NR	93.50%	96 h	23	Mortality	0.291 g	20.2 (10.1-54.7)	Nosaka 1990b	1, 6
Simulium latigonium	Black fly	Simuliidae	S	NR	Analytical	96 h	15	Mortality	NR	270 (170–450)	Beketov 2008	6
Simulium Simulium	Black fly	Simuliidae	S	NR	Analytical	96 h	15	Mortality	NR	3.73 (1.54–9.05)	Beketov 2008	6
Vibrio fischeri	Protobacteria	Vibrionaceae	S	NR	Analytical	30 min	15	Luminescence	NR	61,900 (61,900-62,000)	Tisler 2009	5, 6
Chironomus tentans	Midge	Chironomidae	SR	NR	97.00%	96 h	21	Mortality	12 d post egg deposition	>1000	Bowers 1996	4
Gammarus fossarum	Gammarid	Gammaridae	S	Nom	97.00%	24 h	15	Immobility	Adult male	NR	Malev 2012	4
Chrionomus tenans	Midge	Chironomidae	S	Meas	99.00%	96 h	22	Mortality	12-14 d	>99,800	Dobbs 1994	4
Hyalella azteca	Amphipod	Hyalellidae	S	Meas	99.00%	96 h	22	Mortality	7-21 d	>94,830	Dobbs 1996	4

*CI not reported

Exclusion Reasons

1. Not a standard method
2. Saltwater
3. Low chemical purity or purity not reported
4. Toxicity value not calculable
5. Control response low or not reported
6. Low reliability score
7. Not a standard endpoint

Table 6 Final chronic plant toxicity data set for imidacloprid.

All studies were rated RR. S: static; SR: static renewal; FT: flow-through. NR: not reported, n/a: not applicable. SMCV is in bold.

Species	Common identifier, Family	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/size	NOEC (µg/L)	LOEC (µg/L)	MATC (µg/L)	EC_{50} (µg/L)	Reference
Lemna gibba	Duckweed, Araceae	SR	Meas	98.80%	7 d	25	Frond count/cum frond biomass/growth rate frond counts	Log growth	5,830	12,600	**8,570**	>105,000	Banman 2011

Table 7 Final chronic animal toxicity data set for imidacloprid.

All studies were rated RR. S: static; SR: static renewal; FT: flow-through. NR: not reported

Species	Common identifier	Test type	Chemical grade	Duration	Endpoint	Age/size	NOEC (mg/L)	LOEC (mg/L)	MATC (mg/L)	Reference
Ceriodaphnias dubia	**Water flea**	**SR**	**99.80%**	**6 d**	**Mortality**	**<24 h**	**NR**	**NR**	**LC_{50}: 8,420 (5,360-11,480)**	**Raby 2018b**
Chironomus riparius	**Midge**	**SR**	**99.00%**	**28 d**	**Emergence**	**First instar**	**0.125**	**0.625**	**0.28**	**Naveen 2018**
Chironomus tentans	**Midge**	**SR**	**95.00%**	**10 d**	**Growth**	**Second instar**	**0.67**	**NR**	**NR**	**Gagliano 1991**
Daphnia magna	**Water flea**	**SR**	**95.40%**	**21 d**	**Adult length, time to first brood, young/adult reproduction days**	**<24 h**	**1,800**	**3,600**	**2,500**	**Young 1990b**
Gammarus pulex	**Amphipod**	**SR**	**98.40%**	**28 d**	**Swimming**	**5-10 mm**	**0.064**	**0.128**	**0.0905**	**Hendel 2001**
Oncorhynchus mykiss	**Rainbow trout**	**FT**	**98.20%**	**91 d**	**Hatch success, % swim up, various days post-hatch survival/length/weight**	**Eggs**	**9,020**	**26,900**	**15,600**	**Gries 2002**

Table 8 Acceptable reduced chronic data rated RR with reason for exclusion given below.

S: static; SR: static renewal; FT: flow-through. NR: not reported; Nom: nominal; Meas: measured; Corr: corrected

Species	Common identifier	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/ size	NOEC (µg/L)	LOEC (µg/L)	MATC (µg/L)	Reference	Reason for exclusion
Chironomus tentans	Midge	SR	Meas	95.00%	96 h	22	Survival	Second instar	1.24	NR	NR	Gagliano 1991	A
Chironomus tentans	Midge	SR	Meas	95.00%	10 d	22	Survival	Second instar	1.24	NR	NR	Gagliano 1991	A
Chironomus riparius	Midge	SR	Nom	99.00%	28 d	20	Growth, mortality	First instar	0.625	1.25	0.88	Naveen 2018	A
Chironomus riparius	Midge	SR	Nom	98.40%	28 d	20	Emergence rate	First instar	NR	NR	EC50: 3.11	No Author 2001	A
Lemna gibba	Duckweed	SR	Meas	98.80%	7 d	25	Frond dry weight	Log growth phase	50000	105000	72500	Banman 2011	A
Lemna gibba	Duckweed	SR	Meas	98.80%	7 d	25	Growth rate for dry weights	Log growth phase	105,000	>105,000	NR	Banman 2011	A
Oncorhynchus mykiss	Rainbow trout	FT	Meas	98.20%	31-91 d	10	Hatching rate, arval deformities, larval survival, swim-up 52 d, behavioral change, post hatch survival, length, wet weight, dry weight	Eggs	26900	NR	NR	Gries 2002	A

Oncorhynchus mykiss	Rainbow trout	FT	Meas	98.20%	98 d	8	Hatchability, fry survival, fry growth (length and weight)	Eggs	9800	19000	14000	Cohle 1991	A
Oncorhynchus mykiss	Rainbow trout	FT	Meas	98.20%	91 d	10	Time to hatch, time to swim-up on days 40-49	Eggs	9020	26900	15600	Gries 2002	A

Exclusion Reasons

A. Less sensitive endpoint

Table 9 Supplemental chronic plant toxicity data set for imidacloprid of studies rated RL, LR, or LL.

S: static; SR: static renewal; FT: flow-through. NR: not reported, n/a: not applicable; 95% CI: 95% confidence interval; SE: standard error. **Green: metabolite, 6-chloronicotinic acid**

Species	Common identifier	Test type	Meas/ Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/ size	NOEC (µg/L)	LOEC (µg/L)	EC_{50} (µg/L) (95% CI)	Reference	Rating/ Reason for exclusion
Desmodesmus subspicatus	Microalgae	S	Nom	97.00%	96 h	23	Growth inhibition	Exponential growth	NR	NR	NR	Malev 2012	1
Desmodesmus subspicatus	Microalgae	S	Nom	99.80%	96 h	23	Growth inhibition	Exponential growth	NR	NR	NR	Malev 2012	1
Desmodesmus subspicatus	Microalgae	S	NR	Analytical	72 h	21	Growth rate	NR	IC50: 389,000	NR	NR	Tisler 2009	2
Raphidocelis subcapitata	Green algae	S	Nom	98.60%	72 h	23	Biomass	3 d old preculture	<100,000	<100,000	<100,000	Dorgerloh 2000	1
Raphidocelis subcapitata	Green algae	S	Nom	98.60%	72 h	23	Growth rate	3 d old preculture	<100,000	<100,000	<100,000	Dorgerloh 2000	1
Scenedesmus subspicatus	Green algae	S	Nom	92.80%	96 h	23	Biomass	Cells	10,000	NR	NR	Heimback 1989	1
Scenedesmus subspicatus	Green algae	S	Nom	92.80%	96 h	23	Growth rate	Cells	10,000	NR	NR	Heimback 1989	1

Exclusion Reasons
1. Toxicity value not calculable
2. Low reliability score

Table 10 Supplemental chronic animal toxicity data set for imidacloprid of studies rated RL, LR, or LL.

S: static; SR: static renewal; FT: flow-through. NR: not reported; 95% CI: 95% confidence interval.

Species	Common identifier	Test type	Meas /Nom	Chemical grade	Duration	Temp (°C)	Endpoint	Age/size	NOEC (µg/L)	LOEC (µg/L)	MATC (µg/L) (95% CI)	Reference	Rating/ Reason for exclusion
Chironomus dilutus	Midge	SR	Meas	98.80%	14 d	23	Larval survival	Second instar	NR	NR	NR	Cavallaro 2017	2
Chironomus dilutus	Midge	SR	Meas	98.80%	14 d	23	Emergence	Second instar	NR	NR	NR	Cavallaro 2017	2
Chironomus dilutus	Midge	SR	Meas	98.80%	14 d	23	Biomass, dry weight	Second instar	NR	NR	NR	Cavallaro 2017	2
Chironomus dilutus	Midge	SR	Meas	98.80%	14 d	23	Sex ratio	Second instar	NR	NR	NR	Cavallaro 2017	2
Chironomus dilutus	Midge	SR	Meas	98.80%	14 d	23	% complete emergence, 14 d growth, adult lifespan, days to emergence, no. eggs/mass	5-7 d larvae	NR	NR	NR	Raby 2018c	2
Daphnia magna	Water flea	SR	NR	99.70%	21 d	20	Reproductive rate, body length, growth rate, mortality	Neonate	NR	NR	NR	Ieromina 2014	2
Daphnia magna	Water flea	SR	Corr	99.80%	21 d	20	Mortality, reproduction	<24 h	NR	NR	NR	Raby 2018b	2
Myysidopsis bahia	Mysid	FT	Meas	96.20%	28 d	27	Growth	Post larval	2.85	5.08	3.81	Ward 1991	1
Neocloen triangulifer	Mayfly	SR	Corr	99.90%	32 d	23	% survival to imago	<24 h	NR	NR	NR	Raby 2018c	2

	emergence, days to imago emergence

Exclusion Reasons
1. Saltwater
2. Toxicity value not calculable

Table 11 Threatened, endangered, or rare species predicted values by ICE.

Surrogate		Predicted	
Species	**LC_{50} (µg/L)**	**Species**	**LC_{50} (95% confidence interval) (µg/L)**
Rainbow trout (*O. mykiss*)	211,000	Cutthroat trout (*O. clarkii*)	220,742.14 (127,757.81-318,402.04)*
		Apache trout (*O. gilae*)	121,480.14 (33,652.67-428,521.66)*
		Coho salmon (*O. kisutch*)	145,836.35 (102,390.12-207,717.71)*
		Sockeye salmon (*O. nerka*)	254,140.98 (5,676.58-11,377,900.60)*
		Chinook salmon (*O. tshawytscha*)	186,440.92 (99,410.24-349,664.34)*

*Acute criterion outside the range of the model for this species

Table 12 USEPA Aquatic Life Benchmarks

All units are µg/L. (USEPA 2017)

Acute Fish	Chronic Fish	Acute Invertebrates	Chronic Invertebrates	Acute nonvascular plants
114,500	9,000	0.385	0.01	>10,000

Appendix A – Aqueous Toxicity Data Summaries

Appendix A1 – Aqueous Toxicity Studies Rated RR

Water Toxicity Data Summary

Aedes sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 85.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Aedes* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/hexapoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Quiet eddies of Speed River and ponds in GuelphOntario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	

	Raby 2018a	***Aedes* sp.**
Parameter	**Value**	**Comment**
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	13.8 ± 1.46 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	
pH	8.0	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	346 µS/cm	
Dissolved Oxygen	9.6 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 18.9 (99.4–28.5) LC_{50}: 40.8 (27.9–53.6)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

C. dilutus

Study: Cavallaro, M.C., Morrissey, C.A., Headley, J.V., Peru, K.M. and Liber, K., 2017. Comparative chronic toxicity of imidacloprid, clothianidin, and thiamethoxam to Chironomus dilutus and estimation of toxic equivalency factors. Environmental toxicology and chemistry, 36(2), pp.372-382.

Relevance	Reliability
Score: 90	Score: 92.5
Rating: R	Rating: R

Relevance points taken off for: Standard method (10). 100-10=90

	Cavallaro 2017	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*dilutus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Second instar	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	7 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	4 reps: 14 d 4 reps: 40 d	
Data for multiple times?	14, 40 d	
Effect 1:	Larvae survival	
Control response 1, mean (negative; solvent)	At or near 100 % survival in figures	
Effect 2:	Emergence	
Control response 2, mean (negative; solvent)	>80 % seen in figures	
Effect 3:	Biomass/larvae dry weight	

	Cavallaro 2017	***C. dilutus***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	Not reported	
Effect 4:	Sex ratio/adult male-to-female	
Control response 4, mean (negative; solvent)	Not reported	
Temperature	23 ± 1 º C	
Test type	Static-renewal	3 d
Photoperiod/light intensity	16 l:8 d	
Dilution water	Carbon- and bio-filtered municipal water	
pH	8.2	
Hardness	137 mg/L $CaCO_3$	
Alkalinity	85 mg/L $CaCO_3$	
Conductivity	475 µmhos/cm	
Dissolved Oxygen	>80 %	
Feeding	Tetramin	
Purity of test substance	98.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Mean 83 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC-MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	0.1; 0.11	8 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	0.3; 0.25	8 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	1.0; 0.78	8 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	3.3; 2.62	8 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	10.0; 7.82	8 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; <LOQ	8 reps, 10/rep
LCx (95% CI) (µg/L)	Larvae survival (14 d): LC_{20}: 0.47 (0.29-0.98) LC_{50}: 1.52 (0.99-1.82) LC_{90}: 4.83 (2.48-7.03)	Method: Trimmed Spearman-Karber
EC_x (95% CI) (µg/L)	Emergence (40 d): EC_{20}: 0.06 (0.05-0.17) EC_{50}: 0.39 (0.31-0.42)	Method: ANOVA

	Cavallaro 2017	***C. dilutus***
Parameter	**Value**	**Comment**
	EC_{90}: 0.71 (0.81-0.83) Biomass (14 d, dry weight larvae): EC_{20}: 0.81 (0.05-0.17) EC_{50}: 0.39 (0.31-0.42) Sex ratio (40 d m/f): EC_{20}: 0.06 (0.05-0.17) EC_{50}: 0.39 (0.31-0.42)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-4 =96

Acceptability: Standard method (5), Organisms randomized (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-11 =89

Reliability score: mean(96,89)=92.5

Water Toxicity Data Summary

C. dilutus

Study: Maloney, E.M., Morrissey, C.A., Headley, J.V., Peru, K.M. and Liber, K., 2017. Cumulative toxicity of neonicotinoid insecticide mixtures to Chironomus dilutus under acute exposure scenarios. Environmental toxicology and chemistry, 36(11), pp.3091-3101.

Relevance	Reliability
Score: 90	Score: 88
Rating: R	Rating: R

Relevance points taken off for: Standard method (10). 100-10=90

	Maloney 2017	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*dilutus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	6-7 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	>90 % survival	
Temperature	23 ± 0.4 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Carbon- and bio-filtered tap water	
pH	8.03	
Hardness	111 mg/L $CaCO_3$	

	Maloney 2017	***C. dilutus***
Parameter	**Value**	**Comment**
Alkalinity	117 mg/L $CaCO_3$	
Conductivity	328 µS/cm	
Dissolved Oxygen	7.8 mg/L	
Feeding	Nutrafin daily	
Purity of test substance	98.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	98.6 ± 4.7%	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	6-10 concentrations, 0.4-20.61 exact concentrations not reported	4 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; not reported	4 reps, 10/rep
LC_{50} (95% CI) (µg/L)	4.63 (3.96-5.41)	Method: Trimmed Spearman-Karber

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 10=
90
Acceptability: Standard method (5), Organisms randomized (1), Feeding (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-14 =86

Reliability score: mean(90,86)=88

Water Toxicity Data Summary

C. dilutus

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	Chironomus	
Species	dilutus	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Third instar	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	22.2 ± 0.95 º C	
Test type	Static	

	Raby 2018a	***C. dilutus***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	
pH	8.0	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	363 µS/cm	
Dissolved Oxygen	6.8 mg/L	
Feeding	1.25mL 3:2 ratio cereal grass: ground Nutrafin	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	3 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 1.7 (0.7-2.7) LC_{50}: 11.8 (8.3-15.4)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 1.4 (1.1-1.8) EC_{50}: 2.5 (2.1-2.8)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

C. dilutus

Study: Raby, M., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018. Chronic toxicity of 6 neonicotinoid insecticides to *Chironomus dilutus* and *Neocloeon triangulifer*. Environmental toxicology and chemistry.

Relevance	Reliability
Score: 100	Score: 88.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018c	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	USEPA method 100.5 , 2000	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*dilutus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	5-7 d larvae	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	56 d	
Data for multiple times?	14, 56 d	
Effect 1:	Percent complete emergence	
Control response 1, mean (negative; solvent)	79.2 %	
Effect 2:	14 d growth	
Control response 2, mean (negative; solvent)	0.56 mg	
Effect 3:	Adult lifespan	
Control response 3, mean (negative; solvent)	2.69 d	

	Raby 2018c	***C. dilutus***
Parameter	**Value**	**Comment**
Effect 4:	Days to complete emergence	
Control response 4, mean (negative; solvent)	50.8 d	
Effect 5:	No. eggs/egg mass	
Control response 5, mean (negative; solvent)	1.9	
Temperature	22 ± 0.61 º C	
Test type	Static renewal	3/w
Photoperiod/light intensity	500-1000 lux	
Dilution water	Dechlorinated tap water	
pH	7.6	
Hardness	123 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	365 µS/cm	
Dissolved Oxygen	4.7 mg/L	
Feeding	Daily	
Purity of test substance	99.9 % 99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	0-20 %	
Toxicity values calculated based on nominal or measured concentrations?	Corrected	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	0.078; 0.088	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 2 Nom; Meas (µg/L)	0.156; 0.19	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 3 Nom; Meas (µg/L)	0.156; 0.16	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 4 Nom; Meas (µg/L)	0.312; 0.31	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 5 Nom; Meas (µg/L)	0.312; 0.34	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 6 Nom; Meas (µg/L)	0.625; 0.74	12 reps initially + 7 reps after 7 d, 12/rep

	Raby 2018c	***C. dilutus***
Parameter	**Value**	**Comment**
Concentration 7 Nom; Meas (µg/L)	0.625; 0.65	12 reps initially + 7 reps after 7 d, 12/rep
Concentration 8 Nom; Meas (µg/L)	1.25; 1.2	12 reps initially + 7 reps after 7 d, 12/rep
Control 1 Nom; Meas (µg/L)	Negative: 0; 0	12 reps initially + 7 reps after 7 d, 12/rep
EC_x (95% CI) (µg/L)	Percent complete emergence: EC_{10}: 0.13 (0.11-0.16) EC_{25}: 0.18 (0.16 – 0.21) EC_{50}: 0.24 (0.22 – 0.27) EC_{90}: 0.45 (0.37 – 0.52) 14 d growth: EC_{50}: >0.72 Adult lifespan (d): EC_{10}: 0.41 (0.17 – 0.65) EC_{25}: 0.63 (0.40 – 0.85) EC_{50}: 0.90 (0.72 – 1.09) EC_{90}: 1.50 (1.10 – 1.89) Days to complete emergence: EC_{50}: >1.43 No. eggs/egg mass: EC_{50}: >0.72	Method:

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-13 =87

Acceptability: No prior contamination (4), Organisms randomized (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-10 =90

Reliability score: mean(87,90)=88.5

Water Toxicity Data Summary

C. dubia

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	23 ± 0.65 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***C. dubia***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.01	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	333 µS/cm	
Dissolved Oxygen	8.7 mg/L	
Feeding	Not reported	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	10 reps, 1/rep
Control 1 Nom; Meas (µg/L)	Negative	10 reps, 1/rep
LC_{50} (95% CI) (µg/L)	721,424.9 (51,000-102,000)	Method: log-logistic
EC_{10} (95% CI) (µg/L)	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

C. dubia

Study: Raby, M., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018. Relative chronic sensitivity of neonicotinoid insecticides to *Ceriodaphnia dubia* and *Daphnia magna*. Ecotoxicology and environmental safety, 163, pp.238-244.

Relevance	Reliability
Score: 100	Score: 90
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	OECD test 211, 2012	
Phylum/subphylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	6 d	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	90 % survival	
Effect 2:	Reproduction	No. neonates produced/replicate in first 3 broods
Control response 2, mean (negative; solvent)	24.4	
Temperature	25 ± 1 º C	
Test type	Static-renewal	Daily
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	

	Raby 2018	***C. dubia***
Parameter	**Value**	**Comment**
pH	8.01	
Hardness	123 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	332.5 µmhos/cm	
Dissolved Oxygen	8.97-7.15 mg/L	
Feeding	Raphidocelis subcapitata algae and 0.1 mL yeast-cereal grass-trout chow	
Purity of test substance	99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	4-8 % of those measured	
Toxicity values calculated based on nominal or measured concentrations?	Corrected	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Corrected (mg/L)	1.56; 1.53	10 reps, 1/rep
Concentration 2 Nom; Corrected (mg/L)	3.12; 3.06	10 reps, 1/rep
Concentration 3 Nom; Corrected (mg/L)	6.25; 6.5	10 reps, 1/rep
Concentration 4 Nom; Corrected (mg/L)	12.5; 12.25	10 reps, 1/rep
Concentration 5 Nom; Corrected (mg/L)	25.0; 24.50	10 reps, 1/rep
Concentration 6 Nom; Corrected (mg/L)	50; 49.00	10 reps, 1/rep
Concentration 7 Nom; Corrected (mg/L)	100; 98.00	10 reps, 1/rep
Control 1 Nom; Corrected (mg/L)	Negative: 0; 0	10 reps, 1/rep
LC_{50} (95% CI) (mg/L)	LC_{10}: 3.48 (1.83–5.13) LC_{25}: 5.05 (3.10–7.01) LC_{50}: 8.42 (5.36–11.48) LC_{90}: 33.68 (8.20–59.17)	Method: Weibull or log-logistic
EC_{50} (95% CI) (mg/L)	EC_{10}: 1.36 (0.77–1.94) EC_{25}: 2.07 (1.56–2.57) EC_{50}: 2.98 (2.59–3.37) EC_{90}: 4.93 (3.73–6.13)	Method: Weibull or log-logistic

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-13 =87

Acceptability: Organisms randomized (1), Acclimation (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 7=93

Reliability score: mean(87,93)=90

Water Toxicity Data Summary

C. riparius

Study: Dorgerloh M, Sommer, H. 2002. Acute toxicity of imidacloprid (tech.) to larvae of *Chironomus riparius*. Performed by Bayer AG, Leverkusen, Germany. Report number DOM 22031. Laboratory project ID E 322 2242-7. DPR 314655.

Relevance	Reliability
Score: 100	Score: 92
Rating: R	Rating: R

Relevance points taken off for: none.

	Dorgerloh 2002	***C. riparius***
Parameter	**Value**	**Comment**
Test method cited	"Essentially equivalent to OECD 202, 1984"	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*riparius*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	First instar	
Source of organisms	Laboratory culture	University of Sheffield, United Kingdom
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	3.3 %	
Temperature	20 ± 2 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 1002 lux	
Dilution water	"M7-medium" using reconstituted deionized water	

	Dorgerloh 2002	***C. riparius***
Parameter	**Value**	**Comment**
pH	8.0	
Hardness	213.6 mg/L $CaCO_3$	
Alkalinity	53.4 mg/L $CaCO_3$	
Conductivity	588 µS/cm	
Dissolved Oxygen	7.9 mg/L	86.91 %
Feeding	Fed 0d; Tetra Phyll	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	95.6-101.9 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	8; 8.05	3 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	16; 16.3	3 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	32; 30.6	3 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	64; 62.9	3 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	128; 129	3 reps, 10/rep
Concentration 6 Nom; Meas (mg/L)	10,000	3 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; <0.773	6 reps, 10/rep
LC_{50} (95% CI) (mg/L)	55.2 (48-63)	Method: Probit

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistics method (5), Hypothesis tests (8), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 8=92
Acceptability: Temperature variation (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 8=92

Reliability score: mean(92,92)=92

Water Toxicity Data Summary

C. riparius

Study: Dorgerloh M, Sommer, H. 2001. Influence of imidacloprid (tech.) on development and emergence of larvae of *Chironomus riparius* in water-sediment system. Bayer AG, Leverkusen. Report number DOM 21035. Laboratory project ID E 416 2068 - 7. DPR 314656.

Relevance	Reliability
Score: 100	Score: 92
Rating: R	Rating: R

Relevance points taken off for: none.

	Dorgerloh 2001	***C. riparius***
Parameter	**Value**	**Comment**
Test method cited	Proposals for new OECD guideline 219, 2001 and new BBA method, 1995	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*riparius*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	First instar	
Source of organisms	Laboratory culture	University of Sheffield, United Kingdom
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	28 d	
Data for multiple times?	No	
Effect 1:	Emergence rate	
Control response 1, mean (negative; solvent)	81.7 %	
Effect 2:	Development rate	
Control response 2, mean (negative; solvent)	0.065/d	
Temperature	20 ± 2 º C	
Test type	Static	

	Dorgerloh 2001	***C. riparius***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l: 8 d; 1081 lux	
Dilution water	M7-medium made with reconstituted deionized water	Fine quartz sand, finely ground sphagnum peat, kaolin, calcium carbonate
pH	7.9-8.6	0d water
Hardness	195.8 mg/L $CaCO_3$	0d water
Alkalinity	53.4 mg/L $CaCO_3$	0d water
Conductivity	568 µS/cm	0d water
Dissolved Oxygen	7.1-8.8 mg/L	0d water, 85-97 %
Feeding	~1 mg Tetraphyll/larvae/d every 1-3 d	
Purity of test substance	98.4 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	93.7-102.6 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas 0d (µg/L)	0.35; 0.33	3 reps, 20/rep
Concentration 2 Nom; Meas (µg/L)	0.64; not reported	3 reps, 20/rep
Concentration 3 Nom; Meas (µg/L)	1.14; not reported	3 reps, 20/rep
Concentration 4 Nom; Meas (µg/L)	2.06; 1.93	3 reps, 20/rep
Concentration 5 Nom; Meas (µg/L)	3.70; not reported	3 reps, 20/rep
Concentration 6 Nom; Meas (µg/L)	5.56; not reported	3 reps, 20/rep
Concentration 7 Nom; Meas (µg/L)	10.0; 1.39	3 reps, 20/rep
Control 1 Nom; Meas (µg/L)	0; <0.029	3 reps, 20/rep
EC_x (95% CI) (µg/L)	EC_{15}: 2.25 (1.86-2.73) EC_5: 1.86 EC_{10}: 2.09 EC_{50}: 3.11	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-8 =92

Acceptability: Temperature variation (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-8 =92

Reliability score: mean(92,92)=92

Water Toxicity Data Summary

C. riparius

Study: Naveen, N.C., Fojtova, D., Blahova, L., Rozmankova, E. and Blaha, L., 2018. Acute and (sub) chronic toxicity of the neonicotinoid imidacloprid on Chironomus riparius. Chemosphere. 209: 568-577.

Relevance	Reliability
Score: 100	Score: 92.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Naveen 2018	***C. riparius***
Parameter	**Value**	**Comment**
Test method cited	OECD Guideline 209, 2004	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*riparius*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	3 d, first instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	>90 % survival	
Effect 2:	Growth rate (length/d)	
Control response 2, mean (negative; solvent)	7.28 mm	
Temperature	20 ± 0.5 ° C	
Test type	Static-renewal	3 d
Photoperiod/light intensity	16 l: 8 d	

	Naveen 2018	***C. riparius***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated tap water	
pH	7.87-8.68	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	401-568 S/cm	
Dissolved Oxygen	93-100.9 %	
Feeding	Not reported	
Purity of test substance	99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	118-120 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	0.625; 0.75	5 reps, 20/rep
Concentration 2 Nom; Meas (µg/L)	1.25; not reported	5 reps, 20/rep
Concentration 3 Nom; Meas (µg/L)	2.5; not reported	5 reps, 20/rep
Concentration 4 Nom; Meas (µg/L)	5; not reported	5 reps, 20/rep
Concentration 5 Nom; Meas (µg/L)	10; 11.87	5 reps, 20/rep
LC_x (95% CI) (µg/L)	Mortality: LC_{10}: 0.83 (0.144-1.44) LC_{20}: 1.18 (0.336-1.93) LC_{25}: 1.35 (0.456-2.19) LC_{50}: 2.33 (1.30-4.41) Growth: EC_{10}: 1.64 (1.38-1.95) EC_{20}: 2.41 (2.03-2.87) EC_{25}: 2.79 (2.34-3.32) EC_{50}: 5.03 (4.23-6.00)	Method: Probit
NOEC	0.625	Method: Dunnett's test p: not reported MSD: not reported
LOEC	1.25	
MATC (GeoMean NOEC, LOEC)	0.88	

	Naveen 2018	***C. riparius***
Parameter	**Value**	**Comment**
Effect 1: % control at NOEC	Data not reported; not calculable	
Effect 1: % control at LOEC	Data not reported; not calculable	
Effect 2: % control at NOEC	93 %	6.75 (tmt) / 7.28 (control) * 100 = 93 %
Effect 2: % control at LOEC	93 %	6.77 (tmt) / 7.28 (control) * 100 = 93 %

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Minimum significant difference (2). Total: 100-6 =94

Acceptability: Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Minimum significant difference (1). Total: 100-9 =91

Reliability score: mean(94,91)=92.5

Water Toxicity Data Summary

C. riparius

Study: Naveen, N.C., Fojtova, D., Blahova, L., Rozmankova, E. and Blaha, L., 2018. Acute and (sub) chronic toxicity of the neonicotinoid imidacloprid on Chironomus riparius. Chemosphere. 209: 568-577.

Relevance	Reliability
Score: 100	Score: 90.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Chandran 2018	***C. riparius***
Parameter	**Value**	**Comment**
Test method cited	OECD Guideline 235, 2011	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*riparius*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	24 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	93 % survival	
Temperature	20 ± 0.5 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Dechlorinated tap water	
pH	7.37-7.56	
Hardness	Not reported	
Alkalinity	Not reported	

	Chandran 2018	***C. riparius***
Parameter	**Value**	**Comment**
Conductivity	430.-498 S/cm	
Dissolved Oxygen	97.45-98.80 %	
Feeding	Not reported	
Purity of test substance	99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	98-104 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	1.25; 1.22	5 reps, 5/rep
Concentration 2 Nom; Meas (µg/L)	2.5; 2.53	5 reps, 5/rep
Concentration 3 Nom; Meas (µg/L)	5; 5.17	5 reps, 5/rep
Concentration 4 Nom; Meas (µg/L)	10; 10.27	5 reps, 5/rep
Concentration 5 Nom; Meas (µg/L)	20; 20.70	5 reps, 5/rep
Concentration 6 Nom; Meas (µg/L)	40; 40.93	5 reps, 5/rep
Concentration 7 Nom; Meas (µg/L)	80; 78.97	5 reps, 5/rep
Control 1 Nom; Meas (µg/L)	0; <LOQ	5 reps, 5/rep
LC_x (95% CI) (µg/L)	LC_{10}: 1.62 (0.096-4.73) LC_{20}: 4.48 (0.658-10.2) LC_{25}: 6.6 (1.33-13.9) LC_{50}: 31.5 (15.1-75.9)	Method: Probit
NOEC	5	Method: Dunnett's test p: MSD:
LOEC	10	
MATC (GeoMean NOEC, LOEC)	7.07	
Effect 1: % control at NOEC	Data not reported; not calculable	
Effect 1: % control at LOEC	Data not reported; not calculable	

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-8 =92

Acceptability: Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-11 =89

Reliability score: mean(92,89)=90.5

Water Toxicity Data Summary

C. seuratti

Study: Sánchez-Bayo, F. and Goka, K., 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic toxicology, 78(3), pp.262-271.

Relevance	Reliability
Score: 100	Score: 74
Rating: R	Rating: R

Relevance points taken off for: none.

	Sánchez-Bayo 2006	***C. seuratti***
Parameter	**Value**	**Comment**
Test method cited	OECD 202, 1993	
Phylum/subphylum	Arthropoda/crustacea	
Class	Ostracoda	
Order	Podocopida	
Family	Cyprididae	
Genus	*Cypretta*	
Species	*seuratti*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	NIES Experimental Station in Tsukuba, Japan	
Have organisms been exposed to contaminants?	Possibly because field collected	At least 3 y since last pesticide application
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	Darkness 24 h: 96 % survival 48 h: 96 % survival Light 24 h: 96 % survival 48 h: 94 % survival	
Temperature	22 ± 1 º C	

	Sánchez-Bayo 2006	***C. seuratti***
Parameter	**Value**	**Comment**
Test type	Not reported	
Photoperiod/light intensity	Light treatments: 1. Darkness 2. 16 l: 8 d; 1.3 lux	
Dilution water	Tap water	
pH	7.54-7.83	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	7.06 mg/L	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	Concentration range: 320–320,000 µg/L	3 reps, 5/rep
Control 1 Nom; Meas (µg/L)	Negative	4 reps, 5/rep
LC_{50} (95% CI) (µg/L)	Darkness Not calculable Light 24 h: 732 (456–1176) 48 h: 301 (187–485)	Method: probit
EC_{50} (95% CI) (µg/L)	Darkness 24 h: 12 (5–29) 48 h: 1 (0.4–2) Light 24 h: 46 (13–161) 48 h: 16 (7–39)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-34 =66

Acceptability: Measured concentrations within 20% nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Number of concentrations (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(66,82)=74

Water Toxicity Data Summary

C. sphaericus

Study: Sánchez-Bayo, F. and Goka, K., 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic toxicology, 78(3), pp.262-271.

Relevance	Reliability
Score: 100	Score: 74
Rating: R	Rating: R

Relevance points taken off for: none.

	Sánchez-Bayo 2006	***C. sphaericus***
Parameter	**Value**	**Comment**
Test method cited	OECD 202, 1993	
Phylum/subphylum	Arthropoda/crustacea	
Class	Ostracoda	
Order	Podocopida	
Family	Cyprididae	
Genus	*Chydorus*	
Species	*sphaericus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	NIES Experimental Station in Tsukuba, Japan	
Have organisms been exposed to contaminants?	Possibly because field collected	At least 3 y since last pesticide application
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	Darkness 24 h: 91 % survival 48 h: 89 % survival Light 24 h: 96 % survival 48 h: 91 % survival	
Temperature	22 ± 1 º C	

	Sánchez-Bayo 2006	***C. sphaericus***
Parameter	**Value**	**Comment**
Test type	Not reported	
Photoperiod/light intensity	Light treatments: 1. Darkness 2. 16 l: 8 d; 1.3 klx	
Dilution water	Tap water	
pH	7.54-7.83	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	7.06 mg/L	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	Concentration range: 320–320,000 µg/L	5 reps, 5/rep
Control 1 Nom; Meas (µg/L)	Negative	4 reps, 5/rep
LC_{50} (95% CI) (µg/L)	Darkness not calculable Light 24 h: 161950 (61050–429614) 48 h: 132673 (68426–257240)	Method: probit
EC_{50} (95% CI) (µg/L)	Darkness 24 h: 1469 (250–8619) 48 h: 832 (274–2522) Light 24 h: 18683 (10891–32050) 48 h: 2209 (1289–3787)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Conductivity (2),

Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-34 =66

Acceptability: Measured concentrations within 20% nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Number of concentrations (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(66,82)=74

Water Toxicity Data Summary

C. tentans

Study: Bowers, L.M. 1996. Acute toxicity of ^{14}C-NTN 33893 to *C. tentans* under static conditions. Performed by Bayer Corporation Agriculture Division, Stilwell, Kansas. Report number 107316. Submitted to Bayer Corporation Agriculture Division, Kansas City, Missouri. USEPA MRID 43946602.

Relevance	Reliability
Score: 100	Score: 94
Rating: R	Rating: R

Relevance points taken off for: none.

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	FIFRA Guideline 72-2 Acute toxicity test for freshwater invertebrates	
Phylum/subphylum	Insecta	
Class	Diptera	
Order	Chironomidae	
Family	*Chironomus*	
Genus	*tentans*	
Species	Yes	
Family native to North America?	Insecta	
Age/size at start of test/growth phase	Second instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	85 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	
Temperature	22 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l:8 d; 705.6 lux	

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
Dilution water	Sterilized/filtered spring water blended with dechlorinated tap water	
pH	7.2-7.6	
Hardness	166 mg/L $CaCO_3$	
Alkalinity	98 mg/L $CaCO_3$	
Conductivity	404 µmhos/cm	
Dissolved Oxygen	5.8-8.5 mg/L	66-95 %
Feeding	Tetramin daily	
Purity of test substance	96.9 %	90 %hydrochloride a.i. and 77 % free base a.i.
Concentrations measured?	Yes	
Measured is what % of nominal?	82-200 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom; Meas (mg/L)	0.1; 0.2	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	1.0; 0.87	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	10.0; 8.19	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	100; 82.8	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; <0.01	2 reps, 10/rep
LC_{50} (95% CI) (mg/L)	96 h: >82.8	Method: Specific method not reported; possible methods in computer program listed
EC_{50} (95% CI) (mg/L)	Abnormal behavior: 96 h: 17.0 (10.3-28.1)	Method: Specific method not reported; possible methods in computer program listed
NOEC	8.19	Based on sublethal effects and mortality Method: ANOVA

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
		p: MSD:
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	Cumulative mortality 24-72 h: 118 % survival 96 h: 94 % survival	24-72 h: 100 (tmt) / 85 (mean controls) * 100 = % 96 h: 80 (tmt) / 85 (mean controls) * 100 = 94 %
Effect 2: % control at NOEC	Abnormal behavior 100 % normal	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Significance level (2), Minimum significant difference (2). Total: 100-4 =96

Acceptability: Measured concentrations within 20% nominal (4), Minimum significant difference (1), Point estimates (3). Total: 100-8 =92

Reliability score: mean(96,92)=94

Water Toxicity Data Summary

C. tentans

Study: Gagliano, G.G. 1991. Growth and survival of the midge (*Chironomus tentans*) exposed to NTN 33893 technical under static renewal conditions. Performed by Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. Report number 101985. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42256304.

Relevance	Reliability
Score:100	Score: 95.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Gagliano 1991	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	ASTM, 1988, 1990; USEPA, 1975, 1982, 1985	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*tentans*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Second instar	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	10 d	
Data for multiple times?	Yes	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	0-6 d: 100 % survival 7-10 d: 95 % survival	
Effect 2:	Growth	Dry weight of 10 d survivors
Control response 2, mean (negative; solvent)	Negative: 2.05 mg Solvent: 2.21	
Temperature	22 ± 1 °C	
Test type	Static renewal	
Photoperiod/light intensity	16 l: 8 d; 40-60 footcandles	

	Gagliano 1991	***C. tentans***
Parameter	**Value**	**Comment**
Dilution water	Blended spring water	Filtered and sterilized spring water and dechlorinated municipal water
pH	8.1-8.2	
Hardness	118 mg/L $CaCO_3$	
Alkalinity	83 mg/L $CaCO_3$	
Conductivity	295 µmhos/cm	
Dissolved Oxygen	2.0-8.8 mg/L	23 % (10 d after weekend build up of food)-101 %
Feeding	Tetra-Min and Cerophyll	
Purity of test substance	95.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	99-124 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide, 33 µ/L	
Concentration 1 Nom; Meas (µg/L)	0.33; 0.67	2 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	1.0; 1.24	2 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	3.0; 3.39	2 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	10; 10.2	2 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	33; 34.5	2 reps, 10/rep
Concentration 6 Nom; Meas (µg/L)	100; 102	
Concentration 7 Nom; Meas (µg/L)	300; 329	2 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative: 0; 0.20	2 reps, 10/rep
Control 2 Nom; Meas (µg/L)	Solvent: 0; 0.15	2 reps, 10/rep
LC_{50} (95% CI) (µg/L)	24 h: > 329 48 h: 68.9 (45.2-111) 72 h: 28.7 (19.6-42.3) 96 h: 10.5 (7.7-14.4) 10 d: 3.17 (1.24-10.2)	Method: 48-72 h: probit 96 h: binomial
NOEC (µg/L)	96 h: survival: 1.24	Method:

	Gagliano 1991	***C. tentans***
Parameter	**Value**	**Comment**
	96 h growth: 0.67 10 d survival: 1.24 10 d growth: 0.67	Survival: Fisher's exact test Growth: ANOVA p: 0.05 MSD: not reported
LOEC(µg/L)	Growth: 1.24	
MATC (GeoMean NOEC, LOEC) (µg/L)	Growth: 0.91	
Effect 1: % control at NOEC	Cumulative mortality 96 h (4 d): 100 % survival 10 d: 105 %	96 h: 20 (tmt) / 20 (mean controls) * 100 = 100 % 10 d: 20 (tmt) / 19 (mean controls) * 100 = 105 %
Effect 1: % control at LOEC	Not calculable	
Effect 2: % control at NOEC	Growth 10 d Negative: 100 % Solvent: 93 %	10 d: Negative: 2.06 (tmt) / 2.05 (mean controls) * 100 = 100 % Solvent: 2.06 (tmt) / 2.21 (mean controls) * 100 = 93 %
Effect 2: % control at LOEC	10 d: Negative: 84 % Solvent: 78 %	10 d: Negative:1.72 (tmt) / 2.05 (mean controls) * 100 = 84 % Solvent: 1.72 (tmt) / 2.21 (mean controls) * 100 = 78 %

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2). Total: 100-2 =98

Acceptability: Dissolved oxygen (6), Minimum significant difference (1). Total: 100-7 =93

Reliability score: mean(98,93)=95.5

Water Toxicity Data Summary

C. vidua

Study: Sánchez-Bayo, F. and Goka, K., 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic toxicology, 78(3), pp.262-271.

Relevance	Reliability
Score: 100	Score: 74
Rating: R	Rating: R

Relevance points taken off for: none.

	Sánchez-Bayo 2006	***C. vidua***
Parameter	**Value**	**Comment**
Test method cited	OECD 202, 1993	
Phylum/subphylum	Arthropoda/crustacea	
Class	Ostracoda	
Order	Podocopida	
Family	Cyprididae	
Genus	*Cypridopsis*	
Species	*vidua*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	NIES Experimental Station in Tsukuba, Japan	
Have organisms been exposed to contaminants?	Possibly because field collected	At least 3 y since last pesticide application
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	Darkness 24 h: 95 % survival 48 h: 90 % survival Light 24 h: 97 % survival 48 h: 95 % survival	
Temperature	22 ± 1 º C	

	Sánchez-Bayo 2006	***C. vidua***
Parameter	**Value**	**Comment**
Test type	Not reported	
Photoperiod/light intensity	Light treatments: 1. Darkness 2. 16 l: 8 d; 1.3 klx	
Dilution water	Tap water	
pH	7.54-7.83	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	7.06 mg/L	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	Concentration range: 320–320,000 µg/L	12 reps, 5/rep
Control 1 Nom; Meas (µg/L)	Negative	4 reps, 5/rep
LC_{50} (95% CI) (µg/L)	Darkness 24 h: 542 (45–6581) 48 h: 10 (1.3–73) Light 24 h: >4000 48 h: 715 (365–1400)	Method: probit
EC_{50} (95% CI) (µg/L)	Darkness 24 h: 16 (1.3–210) 48 h: 273 (54–1379) Light 24 h: 8 (1.3–47) 48 h: 3 (0.5–15)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Conductivity (2),

Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-34 =66

Acceptability: Measured concentrations within 20% nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Number of concentrations (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(66,82)=74

Water Toxicity Data Summary

Caecidotea sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 78
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Caecidotea* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Anthropoda/crustacea	
Class	Malacostraca	
Order	Isopoda	
Family	Asellidae	
Genus	*Caecidotea*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Ponds in Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	13.6 ± 0.40 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Caecidotea* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	Not reported	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{50}: >15 600	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 98.0 (–6.1–202.2) EC_{50}: 320.8 (162.0–479.6)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Dissolved oxygen (4), Conductivity (2), pH (3), Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-23 =77

Acceptability: Dissolved oxygen (6), Conductivity (1), pH (2), Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-21 =79

Reliability score: mean(77,79)=78

Water Toxicity Data Summary

Cheumatopsyche sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Cheumatopsyche* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Anthropoda/hexapoda	
Class	Insecta	
Order	Trichoptera	
Family	Hydropsychidae	
Genus	*Cheumatopsyche*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	80 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	80 % mobile	
Temperature	14.5 ± 0.97 º C	

	Raby 2018a	***Cheumatopsyche* sp.**
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	327 µS/cm	
Dissolved Oxygen	10.4 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 48.9 (–3.2–101.0) LC_{50}: 324.5 (72.1–576.8)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 48.6 (12.2–85.1) EC_{50}: 176.4 (99.7–253.1)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

Cloeon sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 87
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Cloeon* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Anthropoda/hexapoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Baetidae	
Genus	*Cloeon*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Ponds in Guelph, Ontario, Canada	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	14.8 ± 0.00 º C	
Test type	Static	

	Raby 2018a	***Cloeon* sp.**
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	270 µS/cm	
Dissolved Oxygen	10.1 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 126.3 (9.5–243.1) LC_{50}: 1152.0 (513.1–1790.8)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: 23.1 (16.2–33.2)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

Coenagrion sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 85.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Coenagrion* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthopoda/hexapoda	
Class	Insecta	
Order	Odonata	
Family	Coenagrionidae	
Genus	*Coenagrion*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Pond in Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	80 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	80 % mobile	
Temperature	14.3 ± 1.82 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Coenagrion* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	8.0	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	295 µS/cm	
Dissolved Oxygen	9.3 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 762.7 (–1835.1–3360.6) LC_{50}: 3462.7 (2046.6–8972.0)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: <5437.5	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Temperature variation (3), Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-15 =85

Reliability score: mean(86,85)=85.5

Water Toxicity Data Summary

D. magna

Study: Ieromina, O., Peijnenburg, W.J., de Snoo, G., Müller, J., Knepper, T.P. and Vijver, M.G., 2014. Impact of imidacloprid on Daphnia magna under different food quality regimes. Environmental toxicology and chemistry, 33(3), pp.621-631.

Relevance	Reliability
Score: 92.5	Score: 85
Rating: R	Rating: R

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Ieromina 2014	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	Modified from OECD 211, 2012	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Neonates	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	21 d	
Data for multiple times?	5, 7, 9, 15, 21 d	
Effect 1:	Net reproductive rate	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Body length	
Control response 2, mean (negative; solvent)	Not reported	
Effect 3:	Growth rate	
Control response 3, mean (negative; solvent)	Somatic growth rate: not reported Von Bertalanffy growth rate: not reported	

	Ieromina 2014	***D. magna***
Parameter	**Value**	**Comment**
Effect 4:	Mortality	
Control response 4, mean (negative; solvent)	≥80 % for all food regimes	From figure
Temperature	20 ° C	
Test type	Static-renewal	3 d
Photoperiod/light intensity	16 l: 8 d	
Dilution water	M4 medium	
pH	Growth medium	
Hardness	Growth medium	
Alkalinity	Growth medium	
Conductivity	Growth medium	
Dissolved Oxygen	Growth medium	
Feeding	Algae containing varying levels of phosphorus per feeding treatment, every 3 d Carbon:phosphorus ratios: 35, 240, 400, 1300	
Purity of test substance	99.7 %	
Concentrations measured?	Yes, for 3/6 concentrations	
Measured is what % of nominal?	99-122 %	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	LC/MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	1.8; not reported/measured	3 reps, 5/rep
Concentration 2 Nom; Meas (mg/L)	25; not reported/measured	3 reps, 5/rep
Concentration 3 Nom; Meas (mg/L)	45; 44.6	3 reps, 5/rep
Concentration 4 Nom; Meas (mg/L)	60; not reported/measured	3 reps, 5/rep
Concentration 5 Nom; Meas (mg/L)	85; 94	3 reps, 5/rep
Concentration 6 Nom; Meas (mg/L)	130; 158	3 reps, 5/rep
Control 1 Nom; Meas (mg/L)	0; not reported/measured	3 reps, 5/rep
EC_x (95% CI) (mg/L)	Carbon:Phosphorus ratio 35 5 d: EC_{50}: 61.72 (56.05-67.96) EC_{10}: 80.83 (73.03-88.63)	Method: logistic Based on survival

	Ieromina 2014	***D. magna***
Parameter	**Value**	**Comment**
	7 d: EC_{50}: 47.69 (44.74-50.84) EC_{10}: 67.66 (63.33-71.99) 9 d: EC_{50}: 39.07 (35.61–44.77) EC_{10}: 59.85 (52.98–66.71) 15 d: EC_{50}: 35.14 (31.26–39.51) EC_{10}: 47.16 (52.69–41.62) 21 d: EC_{50}: 37.24 (31.83–43.58) EC_{10}: 47.16 (39.72–54.60) <u>Carbon:Phosphorus ratio 240</u> 5 d: EC_{50}: 51.88 (37.63–71.53) EC_{10}: 144.64 (97.38–191.89) 7 d: EC_{50}: 40.17 (35.00–46.11) EC_{10}: 68.65 (59.16–78.14) 9 d: EC_{50}: 37.36 (32.70–42.70) EC_{10}: 55.96 (48.47–63.45) 15 d: EC_{50}: 34.76 (28.78–41.98) EC_{10}: 43.28 (35.06–51.50) 21 d: EC_{50}: 34.12 (29.26–39.78) EC_{10}: 43.40 (36.71–50.09) <u>Carbon:Phosphorus ratio 400</u> 5 d: EC_{50}: 71.41 (54.14–94.19) EC_{10}: 141.92 (102.12–181.72)	

	Ieromina 2014	***D. magna***
Parameter	**Value**	**Comment**
	7 d: EC_{50}: 39.53 (34.10–45.81) EC_{10}: 79.69 (67.89–91.49) 9 d: EC_{50}: 33.87 (29.88–38.40) EC_{10}: 60.06 (52.50–67.61) 15 d: EC_{50}: 30.65 (26.67–35.22) EC_{10}: 42.56 (36.62–48.50) 21 d: EC_{50}: 31.1 (26.89–35.98) EC_{10}: 42.85 (36.59–49.11) <u>Carbon:Phosphorus ratio 1300</u> 5 d: EC_{50}: 54.97 (44.43–68.01) EC_{10}: 95.11 (74.71–115.51) 7 d: EC_{50}: 44.55 (40.13–49.46) EC_{10}: 60.10 (53.81–66.40) 9 d: EC_{50}: 42 (36.71–48.04) EC_{10}: 54.16 (46.86–61.47) 15 d: EC_{50}: 28.35 (no CI) EC_{10}: 29.63 (no CI) 21 d: EC_{50}: 28.38 (no CI) EC_{10}: 29.62 (no CI)	

Notes: Range of <u>Carbon:Phosphorus ratios tested.</u> Reliability points not deducted for water quality parameters because growth medium used.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
<u>Documentation:</u> Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-8 =92

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Organisms randomized (1), Temperature variation (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-22 =78

Reliability score: mean(92,78)=85

Water Toxicity Data Summary

D. magna

Study: Raby, M., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018. Relative chronic sensitivity of neonicotinoid insecticides to *Ceriodaphnia dubia* and *Daphnia magna*. Ecotoxicology and environmental safety, 163, pp.238-244.

Relevance	Reliability
Score: 100	Score: 90
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018b	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	Environment Canada, 2007. Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia (EPS 1 RM/21).	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	21 d	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Reproduction	No. neonates produced/replicate over duration

	Raby 2018b	***D. magna***
Parameter	**Value**	**Comment**
Control response 2, mean (negative; solvent)	65.4	
Temperature	20 ± 1 ° C	
Test type	Static-renewal	3/w
Photoperiod/light intensity	16 l: 8 d; 400-800 lux	
Dilution water	Dechlorinated municipal tap water	
pH	8.01	
Hardness	123 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	332.5 µmhos/cm	
Dissolved Oxygen	8.97-7.15 mg/L	
Feeding	*R. subcapitata* and *Chlorella fusca*	
Purity of test substance	99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	4-8 % of those measured	
Toxicity values calculated based on nominal or measured concentrations?	Corrected	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Corrected (mg/L)	1.56; 1.53	10 reps, 1/rep
Concentration 2 Nom; Corrected (mg/L)	3.12; 3.06	reps
Concentration 3 Nom; Corrected (mg/L)	6.25; 6.5	reps
Concentration 4 Nom; Corrected (mg/L)	12.5; 12.25	reps
Concentration 5 Nom; Corrected (mg/L)	25.0; 24.50	reps
Concentration 6 Nom; Corrected (mg/L)	50; 49.00	
Concentration 7 Nom; Corrected (mg/L)	100; 98.00	
Concentration 1 Nom; Corrected (mg/L)	1.56; 1.53	reps
LC_x (95% CI) (mg/L)	LC_{10}: 17.31 (9.57–25.05) LC_{25}: 23.43 (15.00–31.86) LC_{50}: 35.44 (22.78–48.09) LC_{90}: 109.08 (19.48–198.68)	Method: Weibull or log-logistic
EC_{50} (95% CI) (mg/L)	EC_{10}: 2.69 (2.16–3.23) EC_{25}: 3.52 (3.02–4.01)	Method: Weibull or log-logistic

	Raby 2018b	***D. magna***
Parameter	**Value**	**Comment**
	EC_{50}: 4.59 (4.13–5.05) EC_{90}: 7.81 (6.68–8.94)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-13 =87

Acceptability: Organisms randomized (1), Acclimation (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 7=93

Reliability score: mean(87,93)=90

Water Toxicity Data Summary

D. magna

Study: Qi, S., Wang, D., Zhu, L., Teng, M., Wang, C., Xue, X. and Wu, L., 2018. Neonicotinoid insecticides imidacloprid, guadipyr, and cycloxaprid induce acute oxidative stress in Daphnia magna. Ecotoxicology and environmental safety, 148, pp.352-358.

Relevance	Reliability
Score: 92.5	Score: 85
Rating: R	Rating: R

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Qi 2018	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	OECD guideline 202, 2004	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Immobility: not reported Embryonic: yes	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	Not reported	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Embryonic hatching rate	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	21 ± 1 º C	
Test type	Static-renewal	3/w
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Dechlorinated tap water	

	Qi 2018	***D. magna***
Parameter	**Value**	**Comment**
pH	7.5	
Hardness	250 mg/L $CaCO_3$	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	>5.8 mg/L	>65 %
Feeding	*Scenedesmus obliquus* daily	
Purity of test substance	97 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	86-102 %	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD-Q-TOF-MS	
Concentration of carrier (if any) in test solutions	Acetone, 1 %	
Concentration 1 Nom; Meas (mg/L)	Immobility: 1.25; 1.13-1.27	3 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	Immobility and embryonic: 2.5; 2.23-2.52	3 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	Immobility and embryonic: 5.0; 4.33-4.91	3 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	Immobility and embryonic: 10.0; 8.57-9.91	3 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	Immobility and embryonic: 20.0; 20.54-21.73	3 reps, 10/rep
Control 1 Nom; Meas (mg/L)	Negative: 0 Solvent: 0	3 reps, 10/rep
EC_{50} (95% CI) (mg/L)	Immobilization: 16.5 (12.76-21.82) Embryonic hatching rate: 16.2 (12.31-25.77)	Method: probit Immobilization

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Alkalinity (2), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-12 =88

Acceptability: Control response (9), Organisms randomized (1), Alkalinity (2), Conductivity (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(88,82)=85

Water Toxicity Data Summary

D. magna

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 85	Score: 81.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85.

	Raby 2018a	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	20.9 ± 0.06 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***D. magna***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.7	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	313 µS/cm	
Dissolved Oxygen	10.1 mg/L	
Feeding	0.5mL P. subcapitata, 0.5mL Chlorella sp.	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	10 reps, 1/rep
Control 1 Nom; Meas (µg/L)	Negative	10 reps, 1/rep
LC_x (95% CI) (µg/L)	LC_{50}: >102,000	Method: log-logistic

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-22 =78

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100-15 =85

Reliability score: mean(78,85)=81.5

Water Toxicity Data Summary

D. magna

Study: Sánchez-Bayo, F. and Goka, K., 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic toxicology, 78(3), pp.262-271.

Relevance	Reliability
Score: 100	Score: 76.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Sánchez-Bayo 2006	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	OECD 202, 1993	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nauplii, 24 h	
Source of organisms	Aquatron facilities of NIES	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	24 h: 100 % survival 48 h: 98 % survival	
Temperature	22 ± 1 º C	
Test type	Not reported	
Photoperiod/light intensity	16 l: 8 d; 1.3 klx	
Dilution water	Dechlorinated, UV-treated tap water	
pH	7.54-7.83	
Hardness	Not reported	

	Sánchez-Bayo 2006	***D. magna***
Parameter	**Value**	**Comment**
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	7.06 mg/L	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/mg)	Concentration range: 320–320,000 µg/L	12 reps, 5/rep
Control 1 Nom; Meas (µg/L)	Negative	4 reps, 5/rep
LC_{50} (95% CI) (µg/L)	24 h: >320000 48 h: 64873 (7871–534688)	Method: probit
EC_{50} (95% CI) (µg/L)	24 h: 11822 (464–301256) 48 h: 6029 (332–109433)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-29 =71

Acceptability: Measured concentrations within 20% nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Number of concentrations (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(71,82)=76.5

Water Toxicity Data Summary

D. magna

Study: Young, B.M., Hicks, S. L. 1990a. Acute toxicity of NTN 33893 to *Daphnia magna*. Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri. Report number 100245. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. DPR 120637 (DPN 51950-046).

Relevance	Reliability
Score: 100	Score: 96.5
Rating: R	Rating: R

Relevance points taken off for: none

	Young 1990a	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	40 CFR Part 160	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	Neonates
Source of organisms	Laboratory in-house culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	48 h	
Data for multiple times?	4, 24, 48 h	
Effect 1:	Immobility	Acceptable for daphnid acute studies
Control response 1, mean (negative; solvent)	100 % mobile	
Temperature	20 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	16 l : 8 d/50-70 footcandles	
Dilution water	Laboratory well water and reverse osmosis	
pH	8.3-8.4	

	Young 1990a	***D. magna***
Parameter	**Value**	**Comment**
Hardness	140 mg/L $CaCO_3$	
Alkalinity	168 mg/L	
Conductivity	310 µmhos/cm	
Dissolved Oxygen	8.0-8.4 mg/L	94-97 %
Feeding	Not fed	Adults in culture fed
Purity of test substance	95.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	>90 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	16; 15	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	27; 25	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	45; 42	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	75; 71	2 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	125; 113;	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; 0	2 reps, 10/rep
EC_{50} (95% CI) (mg/L)	4 h: >113 24 h: >113 48 h: 85 (71-113)	Method: binominal
NOEC	42 mg/L	Method: not reported p: not reported MSD: not reported
Effect 1: % control at NOEC	100 % mobile	

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100-6 =94

Acceptability: Minimum significant difference (1). Total: 100-1 =99

Reliability score: mean(94,99)=96.5

Water Toxicity Data Summary

D. magna

Study: Young, B.M., Blakemore, G.C. 1990. 21-day chronic static renewal toxicity of NTN 33893 to *Daphnia magna*. Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri. Report number 100247. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. DPR 120647 (DPN 51950-055).

Relevance	Reliability
Score: 100	Score: 96.5
Rating: R	Rating: R

Relevance points taken off for: RR

	Young 1990	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1979, 1981; USEPA 1975, 1976, 1978	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	First instar, < 24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	21 d	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Mean: 98 %	Negative control: 100 ± 0 % Solvent control: 96 ± 8.3 %
Effect 2:	Adult length	
Control response 2, mean (negative; solvent)	4.5 ± 0.10 mm	
Effect 3:	Time to first brood	

	Young 1990	***D. magna***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	7 d	No difference detected
Effect 4:	Young/adult reproduction days	
Control response 4, mean (negative; solvent)	Mean: 15.4 d	Negative control: 15.7 ± 0.17 d Solvent control: 15.1 ± 0.75 d
Temperature	20 ± 2 °C	
Test type	Static renewal	
Photoperiod/light intensity	16 l:8 d/51-53 footcandles	
Dilution water	Hard blended water	
pH	7.7-8.3	
Hardness	140-164 mg/L $CaCO_3$	
Alkalinity	162-180 mg/L	
Conductivity	310-590 µmhos/cm	
Dissolved Oxygen	5.8-8.3 mg/L	63.8-91.3 %
Feeding	Algal suspension and trout chow with yeast 2x/d	
Purity of test substance	95.4 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	>91 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide (DMF)	
Concentration 1 Nom; Meas (mg/L)	0.49; 0.46	4 reps, 6/rep
Concentration 2 Nom; Meas (mg/L)	0.94; 0.86	4 reps, 6/rep
Concentration 3 Nom; Meas (µg/L)	1.9; 1.8	4 reps, 6/rep
Concentration 4 Nom; Meas (mg/L)	3.8; 3.6	4 reps, 6/rep
Concentration 5 Nom; Meas (mg/L)	7.5; 7.3	4 reps, 6/rep
Control 1 Nom; Meas (mg/L)	0; 0	4 reps, 6/rep
Control 2 Nom; Meas (mg/L)	0; 0, DMF solvent	4 reps, 6/rep
EC_{50} (95% CI) (mg/L)	21 d: >7.3	Immobilization Method: not reported
NOEC	21 d: 1.8 mg/L	Method: not reported

	Young 1990	***D. magna***
Parameter	**Value**	**Comment**
		p: <0.05 MSD: not reported
LOEC	21 d: 3.6 mg/L	
MATC (GeoMean NOEC, LOEC)	21 d: 2.5 mg/L	
Effect 1: % control at NOEC	102 %	100 (tmt) / 98 (mean controls) * 100 = 102 %
Effect 1: % control at LOEC	98 %	96 (tmt) / 98 (mean controls) * 100 = 98 %
Effect 2: % control at NOEC	100 %	4.5 (tmt) / 4.5 (mean controls) * 100 = 100 %
Effect 2: % control at LOEC	96 %	4.3 (tmt) / 4.5 (mean controls) * 100 = 96 %
Effect 3: % control at NOEC	100 %	7 (tmt) / 7 (mean controls) * 100 = 100 %
Effect 3: % control at LOEC	100 %	7 (tmt) / 7 (mean controls) * 100 = 100 %
Effect 4: % control at NOEC	107 %	16.5 (tmt) / 15.4 (mean controls) * 100 = 107 %
Effect 4: % control at LOEC	96 %	14.8 (tmt) / 15.4 (mean controls) * 100 = 96 %

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2). Total: 100-2 =98

Acceptability: Carrier solvent (4), Minimum significant difference (1). Total: 100-5 =95

Reliability score: mean(98,95)=96.5

Water Toxicity Data Summary

Ephemerella sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 87
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Ephemerella* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthopoda/hexapoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Ephemerellidae	
Genus	*Ephemerella*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Field-collected in Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	90 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	90 % mobile	
Temperature	14.8 ± 0.21 º C	
Test type	Static	

	Raby 2018a	***Ephemerella* sp.**
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	Nitex screen substrate
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	326 µS/cm	
Dissolved Oxygen	10.6 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 16.1 (2.9–29.4) LC_{50}: 68.2 (33.1–103.3)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: 10.6 (7.5–15.0)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

F. limnocharis

Study: Feng, S., Kong, Z., Wang, X., Zhao, L. and Peng, P., 2004. Acute toxicity and genotoxicity of two novel pesticides on amphibian, Rana N. Hallowell. Chemosphere, 56(5), pp.457-463.

Relevance	Reliability
Score: 100	Score: 69
Rating: R	Rating: R

Relevance points taken off for: none.

	Feng 2004	***F. limnocharis***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Dicroglossidae	
Genus	*Fejervarya*	
Species	*limnocharis*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Tadpole, 1 m old, 33.2 mm, 250 mg	
Source of organisms	Collected from Zhijing Mountain area	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	7 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Temperature	20 ± 1 º C	
Test type	Static-renewal	24 h
Photoperiod/light intensity	Not reported	
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	>8.5 mg/L	> 93.5 %

	Feng 2004	***F. limnocharis***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	95 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	30; not reported	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	45; not reported	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	67.5; not reported	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	101.2; not reported	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	151.8; not reported	1 rep, 10/rep
Concentration 6 Nom; Meas (mg/L)	227.8; not reported	1 rep, 10/rep
Concentration 7 Nom; Meas (mg/L)	341.7; not reported	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	0.64 % NaCl for osmotic equibalance	1 rep, 10/rep
LC_{50} (95% CI) (mg/L)	24 h: 235 (205-269) 48 h: 165 (141-193) 72 h: 116 (100-135) 96 h: 82 (70-96)	Method: Trimmed Spearman-Karber

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-30 =70

Acceptability: Standard method (5), Measured concentrations within 20% nominal (4), No prior contamination (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Conductivity (1), pH (2), Photoperiod (2), Adequate replication (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 32=68

Reliability score: mean(70,68)=69

Water Toxicity Data Summary

G. pulex

Study:
Hendel, B. 2001. Influence of imidacloprid (tech.) of *Gammarus pulex* in a water-sediment system under static conditions. Performed by Bayer AG, Leverkusen, Germany. Report number HDB/SP 01-00. Laboratory project ID E 322 1985-0. DPR 314653.

Relevance	Reliability
Score: 100	Score: 83
Rating: R	Rating: R

Relevance points taken off for: none.

	Hendel 2001	***G. pulex***
Parameter	**Value**	**Comment**
Test method cited	OECD Guideline 219	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	
Species	*pulex*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	5-10 mm	
Source of organisms	Uncultivated grassland, Langenfeld, Germany	
Have organisms been exposed to contaminants?	Possibly because field-collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	28 d	
Data for multiple times?	0, 7, 14, 20, 28 d	
Effect 1:	Survival	
Control response 1, mean (negative; solvent)	Part 1, 28d: 99 % Part 2: 28d: 98 %	
Effect 2:	Swimming	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	14 ± 2° C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 800 lux	

	Hendel 2001	***G. pulex***
Parameter	**Value**	**Comment**
Dilution water	M7-Medium made with reconstituted deionized water	2 cm sediment substrate: fine quartz sand, sphagnum peat, kaolin, and $CaCO_3$
pH	Part 1: 7.6 Part 2: 7.0	
Hardness, mg/L $CaCO_3$	Part 1: 178.0 Part 2: 195.8	
Alkalinity, mg/L $CaCO_3$	Part 1: 53.4 Part 2: 53.4	
Conductivity, µS/cm	Part 1: 591 Part 2: 612	
Dissolved Oxygen, mg/L	Part 1: 8.6 Part 2: 9.4	
Feeding	Alder leaves, weekly	
Purity of test substance	Part 1: 98.4 % Part 2: 98.6 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Did not exceed 20 % variation at 0d	Concentration declined continuously (45.6 % 7d, 23.8 % 28d)
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	Part 1: 0.0005; Not reported Part 2: 0.032; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 2 Nom; Meas (mg/L)	Part 1: 0.001; Not reported Part 2: 0.064; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 3 Nom; Meas (mg/L)	Part 1: 0.002; Not reported Part 2: 0.128; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 4 Nom; Meas (mg/L)	Part 1: 0.004; Not reported Part 2: 0.256; Not reported	Unknown reps, unknown/rep

	Hendel 2001	***G. pulex***
Parameter	**Value**	**Comment**
		(Statistical results show sample size 4)
Concentration 5 Nom; Meas (mg/L)	Part 1: 0.008; Not reported Part 2: 0.512; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 6 Nom; Meas (mg/L)	Part 1: 0.016; Not reported Part 2: 0.512; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 7 Nom; Meas (mg/L)	Part 1: 0.032; Not reported Part 2: 1.024; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 8 Nom; Meas (mg/L)	Part 1: 0.064; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Concentration 9 Nom; Meas (mg/L)	Part 1: 0.128; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
Control 1 Nom; Meas (mg/L)	0; Not reported	Unknown reps, unknown/rep (Statistical results show sample size 4)
NOEC	Mortality: 0.128 mg/L Swimming: 0.064 mg/L	Method: Wilcoxon & Wilcox p: 0.05 MSD: Not reported
LOEC	Mortality: 0.256 mg/L Swimming: 0.128 mg/L	
MATC (GeoMean NOEC, LOEC)	Mortality: 0.181 mg/L Swimming: 0.0905 mg/L	
Effect 1: % control at NOEC	Mortality, 28 d Part 1: 82 % Part 2: 91 %	Part 1: 81 (tmt) / 99 (mean controls) * 100 = 82 %

	Hendel 2001	***G. pulex***
Parameter	**Value**	**Comment**
		Part 2: 89 (tmt) / 98 (mean controls) * 100 = 91 %
Effect 1: % control at LOEC	Mortality, 28 d Part 1: not calculable Part 2: 76 %	Part 1: not calculable Part 2: 74 (tmt) / 98 (mean controls) * 100 = 76 %
Effect 2: % control at NOEC	Not calculable	
Effect 2: % control at LOEC	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Measured concentrations (3), Minimum significant difference (2), Point estimates (8). Total: 100- 13=87

Acceptability: Measured concentrations within 20% nominal (4), No prior contamination (4), Adequate organisms per rep (2), Temperature variation (3), Random design (2), Adequate replication (2), Minimum significant difference (1), Point estimates (3). Total: 100- 21=79

Reliability score: mean(87, 79)=83

Water Toxicity Data Summary

G. pulex

Study: Agatz, A., Ashauer, R. and Brown, C.D., 2014. Imidacloprid perturbs feeding of Gammarus pulex at environmentally relevant concentrations. Environmental toxicology and chemistry, 33(3), pp.648-653.

Relevance	Reliability
Mortality Score: 75, Feeding rate score: 75	Score: 83.5
Rating: L	Rating: R

Mortality:
Relevance points taken off for: Standard method (10), Endpoint (15). 100-25=75
Feeding rate:
Relevance points taken off for: Standard method (10), Toxicity value (15). 100-25=75

	Agatz 2014	***G. pulex***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	
Species	*Pulex*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Dry weight 3.8-15.0 mg	
Source of organisms	Stream in Bishop Wilton, UK	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	3 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Feeding rate	
Control response 2, mean (negative; solvent)	see figure 2	
Temperature	13 ± 1 º C	

	Agatz 2014	***G. pulex***
Parameter	**Value**	**Comment**
Test type	Static renewal	48 h renewal
Photoperiod/light intensity	12 l: 12 d; 750-900 lux	
Dilution water	Artificial pond water	
pH	7.4-7.9	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	>75 %	
Feeding	Horse chestnut leaf discs treated with *Cladosporium*	
Purity of test substance	99.0 %	
Concentrations measured?	Yes but not reported	
Measured is what % of nominal?	11 %	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (µg/L)	0.81; not reported	10 reps, 1/rep
Concentration 2 Nom; Meas (µg/L)	2.7; not reported	10 reps, 1/rep
Concentration 3 Nom; Meas (µg/L)	9.0; not reported	10 reps, 1/rep
Concentration 4 Nom; Meas (µg/L)	30; not reported	10 reps, 1/rep
Concentration 5 Nom; Meas (µg/L)	100; not reported	10 reps, 1/rep
Control 1 Nom; Meas (mg/L)	0; not reported	3 reps, 1/rep
EC_{50} (95% CI) (µg/L)	24 h: 18.96 (14.93-23.05) 48 h: 20.59 (6.48-72.01) 72 h: 10.50 (CI not reported) 96 h: 5.34 (CI not reported)	Based on feeding rate Method: probit
EC_{10} (95% CI) (µg/L)	24 h: 9.05 (5.15-12.10) 48 h: 3.28 (0.005-8.81) 72 h: 2.03 (CI not reported) 96 h: 2.05 (CI not reported)	Based on feeding rate Method: probit

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 13=87

Acceptability: Standard method (5), No prior contamination (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-20 =80

Reliability score: mean(87,80)=83.5

Water Toxicity Data Summary

Gyrinus sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 87
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Gyrinus* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/hexapoda	
Class	Insecta	
Order	Coleoptera	
Family	Gyrinidae	
Genus	*Gyrinus*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Ponds in Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	14.9 ± 0.42 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Gyrinus* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.1	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	334 µS/cm	
Dissolved Oxygen	9.9 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 79.6 (47.4–111.8) LC_{50}: 132.2 (99.9–164.5)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 28.0 (14.9–41.2) EC_{50}: 57.5 (40.5–74.5)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

H. azteca

Study: England, D. and Bucksath, J.D. 1991. Acute toxicity of NTN 33893 to *Hylella azteca*. Performed by ABC Laboratories, Inc., Columbia, Missouri. Reported number 101960. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42256303.

Relevance	Reliability
Score: 100	Score: 94.5
Rating: R	Rating: R

Relevance points taken off for: none.

	England 1977	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	FIFRA, 40 CFR, Part 158.145 Guideline No. 72-2	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	2-3 mm	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	24-96 h: 100 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	24-96 h: 100 % normal	
Temperature	20 ± 2 °C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	

	England 1977	***H. azteca***
Parameter	**Value**	**Comment**
Dilution water	Hard blended water	Reverse osmosis well water with hard well water
pH	8.3	
Hardness	180 mg/L $CaCO_3$	
Alkalinity	194 mg/L $CaCO_3$	
Conductivity	340 µMhos/cm	
Dissolved Oxygen	5.2-8.2 mg/L	57-90 %
Feeding	Not reported	
Purity of test substance	Technical grade, % not reported	
Concentrations measured?	Yes	
Measured is what % of nominal?	100-104 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	0.33; 0.35	2 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	1.0; 0.97	2 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	3.3; 3.5	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	10; 10	2 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	33; 34	2 reps, 10/rep
Concentration 6 Nom; Meas (µg/L)	100; 100	2 reps, 10/rep
Concentration 7 Nom; Meas (µg/L)	330; 340	2 reps, 10/rep
Concentration 8 Nom; Meas (µg/L)	1000; 1000	2 reps, 10/rep
Concentration 9 Nom; Meas (µg/L)	3000; 3100	2 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; 0	2 reps, 10/rep
LC_{50} (95% CI) (µg/L)	24-48 h: not calculable 72 h: 1756 (884-5448) 96 h: 526 (194-1263)	Method: 72 h: probit 96 h: moving average

	England 1977	***H. azteca***
Parameter	**Value**	**Comment**
EC_{50} (95% CI) (µg/L)	Based on immobility: 24 h: 218 (148-324) 48 h: 129 (85-193) 72 h: 113 (77-165) 96 h: 55 (34-93)	Based on immobility: Method: 24, 96 h: moving average 48, 72 h: probit
NOEC	96 h: 0.35 µg/L	Method: p: MSD:
LOEC	96 h: 0.97 µg/L	
MATC (GeoMean NOEC, LOEC)	0.58 µg/L	
Effect 1: % control at NOEC	Cumulative mortality 24-96 h: 100 % survival	### (tmt) / ### (mean controls) * 100 = %
Effect 1: % control at LOEC	24-72 h: 100 % survival 96 h: 95 % survival	19 (tmt) / 20 (mean controls) * 100 = 95 %
Effect 2: % control at NOEC	Abnormal behavior 24-96 h: 100 % normal	
Effect 2: % control at LOEC	24-72 h: 100 % normal 96 h: 95 % normal	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2). Total: 100-2 =98

Acceptability: Dissolved oxygen (6), Random design (2), Minimum significant difference (1). Total: 100-9 =91

Reliability score: mean(98,91)=94.5

Water Toxicity Data Summary

H. azteca

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	2–9 d old, within 2 d of each other	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	80 % mobile	
Temperature	22.4 ± 0.91 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***H. azteca***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	7.8	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	360 µS/cm	
Dissolved Oxygen	6.3 mg/L	
Feeding	2mg ground Nutrafin	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	3 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 114.0 (73.1–155.0) LC_{50}: 363.2 (301.3–425.1)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 77.2 (51.4–102.9) EC_{50}: 176.9 (149.4–204.4)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

H. azteca

Study: Roney D.J., Bowers, L.M. 1996. Acute toxicity of ^{14}C-NTN 33893 to *Hylella Azteca* under static conditions. Performed by Bayer Corporation Agriculture Division, Stilwell, Kansas. Report number 107315. Submitted to Bayer Corporation Agriculture Division, Kansas City, Missouri. USEPA MRID 43946601.

Relevance	Reliability
Score: Abnormal behavior: 85; Mortality: 100	Score: 95
Rating: Abnormal behavior: L; Mortality: R	Rating: R

Abnormal behavior:
Relevance points taken off for: Toxicity endpoint (15). 100-15=85

Mortality:
Relevance points taken off for: none.

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	FIFRA Guideline 72-2 Acute Toxicity Test for Freshwater Invertebrates	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	14-21 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	96 h: 90 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
Effect 3:	Head length	
Control response 3, mean (negative; solvent)	0.39 mm	
Temperature	22 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 60-70 footcandles	
Dilution water	Hard blended water	Sterilized/filtered spring water blneded with dechlorinated tap water
pH	7.4-7.7	
Hardness	166 mg/L $CaCO_3$	
Alkalinity	120 mg/L $CaCO_3$	
Conductivity	425 µmhos/cm	
Dissolved Oxygen	7.8-8.2 mg/L	89-94 %
Feeding	Not fed during test	
Purity of test substance	96.9 % 80.2 % 83.3 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	102-106 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	No solvents used	
Concentration 1 Nom; Meas (mg/L)	5.3; 5.6	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	10.7; 11.0	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	21.4; 22.1	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	42.7; 43.8	2 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	85.4; 86.8	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; 0	2 reps, 10/rep
LC_{50} (95% CI) (mg/L)	48 h: 63.6 (53.9-75.1) 72 h: 55.8 (48.2-64.5) 96 h: 51.8 (44.0-60.9)	Method: Spearman-Karber
EC_{50} (95% CI) (mg/L)	96 h: 29.0 (24.7-34.0)	Method:

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
NOEC	96 h: 22.1	Based on mortality Method: ANOVA p: MSD:
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	Cumulative mortality 94 % survival	85 (tmt) / 90 (mean controls) * 100 = 94 %
Effect 2: % control at NOEC	Abnormal behavior 85 % normal	85 (tmt) / 100 (mean controls) * 100 = 85 %
`Effect 3: % control at NOEC	Head length Not calculable with provided data (controls only)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100-6 =94

Acceptability: Minimum significant difference (1). Total: 100-1 =99

Reliability score: mean(94,99)=95

Water Toxicity Data Summary

Hexagenia spp. Bartlett 2018

Study: Bartlett, A.J., Hedges, A.M., Intini, K.D., Brown, L.R., Maisonneuve, F.J., Robinson, S.A., Gillis, P.L. and de Solla, S.R., 2018. Lethal and sublethal toxicity of neonicotinoid and butenolide insecticides to the mayfly, Hexagenia spp. Environmental Pollution, 238, pp.63-75.

Relevance	Reliability
Score: 90	Score: 87.5
Rating: R	Rating: R

Relevance points taken off for: Standard method (10). 100-10=90

	Bartlett 2018	***Hexagenia* spp.**
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Class	Insecta	
Order	Ephemeroptera	
Family	Ephemeridae	
Genus	*Hexagenia*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymph, 5-8 mg	
Source of organisms	Lake St. Clair, Ontario, Canada	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	Acute test: 96 h Sublethal test: 96 h water only then 21 d recovery	
Data for multiple times?	No	
Effect 1:	Mortality	Both tests
Control response 1, mean (negative; solvent)	90-100 %	
Effect 2:	Behavior	Acute test
Control response 2, mean (negative; solvent)	Acute test: 78.15 % burrow Sublethal test: 100 % burrow	
Effect 3:	Growth, wet weight	

	Bartlett 2018	***Hexagenia* spp.**
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	Sublethal test: 269.47 mg	
Temperature	Not reported	
Test type	Static	
Photoperiod/light intensity	Not reported	
Dilution water	Filtered, dechlorinated tap water	Acute test: Water only, no sediment Sublethal test: Water during exposure followed by 21 d in sediment from reference site in Long Point Marsh, Lake Erie, Ontario, Canada
pH	Acute: 8.2 Sublethal: 8.4	
Hardness	Culture water: 120-140 mg/L	
Alkalinity	Culture water: 87-110 mg/L	
Conductivity	Acute: 0.34 mS/cm Sublethal: 0.42 mS/cm	
Dissolved Oxygen	Acute test: 7.3 mg/L Sublethal test: 8.0 mg/L	Acute test: 7.3 mg/L Sublethal test: 8.0 mg/L
Feeding	Acute test: Tetramin, d 1,3 Sublethal test: Tetramin-cereal grass media/Brewer's yeast slurry, 1/w	
Purity of test substance	≥95 %	
Concentrations measured?	Control and 3 exposures	
Measured is what % of nominal?	83.8-119	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	Acute test: 0.1; not reported	2 reps, 10/rep

	Bartlett 2018	***Hexagenia* spp.**
Parameter	**Value**	**Comment**
	Sublethal test: 0.1; not reported	
Concentration 2 Nom; Meas (µg/L)	Acute test: 1; not reported Sublethal test: 1; not reported	2 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	Acute test: 10; not reported Sublethal test: 10; not reported	2 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	Acute test: 100; not reported	2 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	Acute test: 1000; not reported	2 reps, 10/rep
Concentration 6 Nom; Meas (µg/L)	Acute test: 10,000; not reported	2 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; not reported	3 reps, 10/rep
LC_x (95% CI) (µg/L)	Acute test: LC_{50}: 900 (290-2800) LC_{25}: 120 (21-720)	Method: logistic
EC_x (95% CI) (µg/L)	Based on behavior: Acute test: EC_{50}: 10 (2.5-42) EC_{25}: 0.98 (0.11-8.4)	Method: logistic
NOEC	Sublethal test: 1	Method: ANOVA, Fisher's LSD p: 0.05 MSD: 27
LOEC	Sublethal test: 10	
MATC (GeoMean NOEC, LOEC)	Sublethal test: 3.16	
Effect 2: % control at NOEC	Burrow: 66 %	51.4 (tmt) / 78.15 (mean controls) * 100 = 66 %
Effect 2: % control at LOEC	Burrow: 55 %	42.7 (tmt) / 78.15 (mean controls) * 100 = 55 %

Notes: Acute test performed twice.Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Photoperiod (3), Temperature (4). Total: 100-7 =93

Acceptability: Standard method (5), Organisms randomized (1), Temperature (6), Photoperiod (2), Random design (2), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(93,82)=87.5

Water Toxicity Data Summary

Hexagenia spp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Hexagenia* spp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Class	Insecta	
Order	Ephemeroptera	
Family	Ephemeridae	
Genus	*Hexagenia*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	4-6 mg	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	80 % mobile	
Temperature	21.9 ± 1.07 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	

	Raby 2018a	***Hexagenia* spp.**
Parameter	**Value**	**Comment**
pH	8.1	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	352 µS/cm	
Dissolved Oxygen	7.4 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	3 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 427.7 (47.7–807.6) LC_{50}: 9320.5 (3757.2–14883.8)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_x: not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

I. bicolor

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***I. bicolor***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Isonychiidae	
Genus	*Isonychia*	
Species	*bicolor*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	15 ± 1.15 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***I. bicolor***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	329 µS/cm	
Dissolved Oxygen	10.3 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 113.2 (–18.1–244.4) LC_{50}: 715.2 (319.3–1111.0)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 31.4 (16.9–45.8) EC_{50}: 60.4 (43.2–77.7)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

I. dentifera

Study: Sánchez-Bayo, F. and Goka, K., 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic toxicology, 78(3), pp.262-271.

Relevance	Reliability
Score: 100	Score: 74
Rating: R	Rating: R

Relevance points taken off for: none.

	Sánchez-Bayo 2006	***I. dentifera***
Parameter	**Value**	**Comment**
Test method cited	OECD 202, 1993	
Phylum/subphylum	Arthropoda/crustacea	
Class	Ostracoda	
Order	Podocopida	
Family	Ilyocyprididae	
Genus	*Ilyocypris*	
Species	*dentifera*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	NIES Experimental Station in Tsukuba, Japan	
Have organisms been exposed to contaminants?	Possibly because field collected	At least 3 y since last pesticide application
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	Darkness 24 h: 100 % survival 48 h: 96.5 % survival Light 24 h: 97 % survival 48 h: 95 % survival	
Temperature	22 ± 1 º C	

	Sánchez-Bayo 2006	***I. dentifera***
Parameter	**Value**	**Comment**
Test type	Not reported	
Photoperiod/light intensity	Light treatments: 1. Darkness 2. 16 l: 8 d; 1.3 klx	
Dilution water	Tap water	
pH	7.54-7.83	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	7.06 mg/L	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	Concentration range: 320–320,000 µg/L	15 reps, 5/rep
Control 1 Nom; Meas (µg/L)	Negative	4 reps, 5/rep
LC_{50} (95% CI) (µg/L)	Darkness 24 h: 759 (337–1709) 48 h: 214 (98–463) Light 24 h: 1122 (518–2432) 48 h: 517 (270–989)	Method: probit
EC_{50} (95% CI) (µg/L)	Darkness 24 h: 5 (1–25) 48 h: 3 (0.2–48) Light 24 h: 13 (4–48) 48 h: 3 (1–11)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Conductivity (2),

Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-34 =66

Acceptability: Measured concentrations within 20% nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Conductivity (1), Number of concentrations (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-18 =82

Reliability score: mean(66,82)=74

Water Toxicity Data Summary

L. gibba

Study: Banman, C.S., Howerton, J.H., Lam, C.V. 2011. Toxicity of Imidacloprid technical to duckweed (*Lemna gibba* G3) under static-renewal conditions. Performed by Bayer CropScience Ecotoxicology, Stilwell, Kansas. Laboratory project ID EBNTL099. Submitted to Bayer CropScience, Research Triangle Park, North Carolina. USEPA MRID 48648601.

Relevance	Reliability
Score: 100	Score: 96.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Banman 2011	***L. gibba***
Parameter	**Value**	**Comment**
Test method cited	Guidelines: FIFRA 123-2, OPPTS 850.4400, OECD 221	
Order	Alismatales	
Family	Araceae	
Genus	*Lemna*	
Species	*gibba*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Log growth	
Source of organisms	USDA Fruit Laboratory, Beltsville, Maryland	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	7 d	
Data for multiple times?	No	
Effect 1:	Frond count	
Control response 1, mean (negative; solvent)	231 fronds	
Effect 2:	Growth rate for frond numbers	
Control response 2, mean (negative; solvent)	0.01759/day	
Effect 3:	Cumulative biomass for frond	

	Banman 2011	***L. gibba***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	11984	
Effect 4:	Frond dry weight	
Control response 4, mean (negative; solvent)	0.0289 g	
Effect 5:	Growth rate for frond dry weight	
Control response 5, mean (negative; solvent)	0.01707/day	
Temperature	24.5 ± 0.16 º C	
Test type	Static-renewal	3 d renewal
Photoperiod/light intensity	24 l: 0 d; 5410 lux	
Dilution water	Distilled water in media; 20X-AAP medium	
pH	7.5	
Conductivity	1486 µmhos/cm	
Feeding	Growth medium, 20X-AAP medium	
Purity of test substance	98.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	93-105 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	6.25; 5.83	3 reps, 12 fronds/rep
Concentration 2 Nom; Meas (mg/L)	12.5; 12.6	3 reps, 12 fronds/rep
Concentration 3 Nom; Meas (mg/L)	25; 23	3 reps, 12 fronds/rep
Concentration 4 Nom; Meas (mg/L)	50; 50	3 reps, 12 fronds/rep
Concentration 5 Nom; Meas (mg/L)	100; 105	3 reps, 12 fronds/rep
Control 1 Nom; Meas (mg/L)	0; <0.61	3 reps, 12 fronds/rep
EC_{50} (95% CI) (mg/L)	Frond count: >105 Growth rate for frond numbers: >105	Method: Logistic Model or Bruce/Versteeg

	Banman 2011	***L. gibba***
Parameter	**Value**	**Comment**
	Cumulative biomass for frond: >105 Frond dry weight: >105 Growth rate for frond dry weight: >105	Cumulative Normal Model
NOEC	Frond count, cumulative biomass for frond, growth rate for frond counts: 5.83 mg/L Frond dry weight: 50 mg/L Growth weight for dry weights: 105 mg/L	Method: ANOVA, Dunnett's Test p: 0.05 MSD:
LOEC	Frond count, cumulative biomass for frond, growth rate for frond counts: 12.6 mg/L Frond dry weight: 105 mg/L Growth rate for dry weights: >105 mg/L	
MATC (GeoMean NOEC, LOEC)	Frond count, cumulative biomass for frond, growth rate for frond counts: 8.57 mg/L Frond dry weight: 72.5 mg/L Growth rate for dry weights: not calculable	
Effect 1: % control at NOEC	Frond count 97 %	224 (tmt) / 231 (mean controls) * 100 = 97 %
Effect 1: % control at LOEC	80 %	185 (tmt) / 231 (mean controls) * 100 = 80 %
Effect 2: % control at NOEC	Growth rate for frond numbers 99 %	0.01741 (tmt) / 0.01759 (mean controls) * 100 = 99 %
Effect 2: % control at LOEC	92 %	0.01627 (tmt) / 0.01759 (mean

	Banman 2011	***L. gibba***
Parameter	**Value**	**Comment**
		controls) * 100 = 92 %
Effect 3: % control at NOEC	Cumulative biomass for frond 97 %	11640 (tmt) / 11984 (mean controls) * 100 = 97 %
Effect 3: % control at LOEC	85 %	10132 (tmt) / 11984 (mean controls) * 100 = 85 %
Effect 4: % control at NOEC	Frond dry weight 97 %	0.0280 (tmt) / 0.0289 (mean controls) * 100 = 97 %
Effect 4: % control at LOEC	81 %	0.0234 (tmt) / 0.0289 (mean controls) * 100 = 81 %
Effect 5: % control at NOEC	Growth rate for frond dry weight 93 %	0.01581 (tmt) / 0.01707 (mean controls) * 100 = 93 %
Effect 5: % control at LOEC	Not calculable	

Notes: Reliability points not deducted for some dilution water parameters not reported for plant growth media.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2). Total: 100-2 =98

Acceptability: Organisms randomized (1), Minimum significant difference (1), Point estimates (3). Total: 100- 5=95

Reliability score: mean(98,95)=96.5

Water Toxicity Data Summary

L. variegatus

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***L. variegatus***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Annelida	
Class	Clitellata	
Order	Lumbriculida	
Family	Lumbriculidae	
Genus	*Lumbriculus*	
Species	*variegatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	age-synchronized to 7 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	21.7 ± 0.61 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***L. variegatus***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	348 µS/cm	
Dissolved Oxygen	8.1 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	3 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 42.6 (9.9–75.4) LC_{50}: 45.4 (30.6–60.1)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 30.4 (8.5–52.3) EC_{50}: 32.4 (26.7–38.0)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

McCaffertium sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***McCaffertium sp.***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/hexapoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Heptageniidae	
Genus	*McCaffertium*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	90 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	14.6 ± 1.10 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***McCaffertium sp.***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	330 µS/cm	
Dissolved Oxygen	10.4 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 738.7 (314.9–1162.5) LC_{50}: 1810.2 (1018.2–2602.3)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: 10.6 (7.5–15.0)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(86,88)=87

Water Toxicity Data Summary

Micrasema sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 78
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Micrasema* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/hexapoda	
Class	Insecta	
Order	Trichoptera	
Family	Brachycentridae	
Genus	*Micrasema*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	95 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	95 % mobile	
Temperature	15.0 ± 0.00 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Micrasema* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	Not reported	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 7.0 (3.8–10.1) LC_{50}: 14.6 (11.0–18.2)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: <6.4	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Dissolved oxygen (4), Conductivity (2), pH (3), Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-23 =77

Acceptability: Dissolved oxygen (6), Conductivity (1), pH (2), Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-21 =79

Reliability score: mean(77,79)=78

Study: Moring, J.B., Kennedy, J.H., and Wiggins, J. 1992. Assessment of the potential ecological and biological effects of NTN 33893 on aquatic ecosystems as measured in fiberglass pond systems. Performed by University of North Texas Water Research Field Station, Denton, Texas. Report number 102600. Submitted by Miles, Inc. Agricultural Division, Kansas City, Missouri. USEPA MRID 42256306

Study summary: Fifteen treatment tanks, 3 control tanks (3 reps/tmt). Duration: 8 weeks. Field-collected *H. azteca* amphipod added to tanks. Minor impacts to *H. azteca*.

Documentation and acceptability (reliability) evaluation for data derived from aquatic outdoor field and indoor model ecosystems experiments. Include notes next to each parameter. Adapted from ECOTOX 2006; Table from TenBrook et al. 2010.

Parameter[a]	Score[b]	**Points**
Results published or in signed, dated format	5	**5**
Exposure duration and sample regime adequately described **Yes**	6	**6**
Unimpacted site (Score 7 for artificial systems) **Artificial**	7	**7**
Adequate range of organisms in system (1º producers, 1º, 2º consumers) **Field-collected *H. Azteca* (2º) and associated algae from environmental sediment 'seed'**	6	**6**
Chemical		
Grade or purity stated **Technical grade. 95.8%**	6	**6**
Concentrations measured/estimated and reported **Nominal: 2, 6, 20, 60, 180 µg/L**	8	**8**
Analysis method stated **HPLC**	2	**2**
Habitat described (e.g., pond, lake, ditch, artificial, lentic, lotic) **Fiberglass tank**	6	**6**
Water quality		
Source identified **Pond/well water water plus sediment from established local ponds**	2	**2**
Hardness reported **17-98**	1	**1**
Alkalinity reported **58-173**	1	**1**
Dissolved oxygen reported **8.1-14.1 mg/L**	2	**2**
Temperature reported **18-28**	2	**2**
Conductivity reported **Not reported**	1	**0**
pH reported **8.33-10.14**	1	**1**
Photoperiod reported **Ambient**	1	**1**
Organic carbon reported **Not reported**	2	**0**
Chemical fate reported **Recoveries and max post application concentrations**	3	**3**
Geographic location identified (Score 2 for indoor systems) **Yes, outdoor**	2	**2**
Pesticide application		

Parameter[a]	Score[b]	**Points**
Type reported (e.g., spray, dilutor, injection) **Water based direct application via mixed slurry poured into tank followed by stirring**	2	**2**
Frequency reported **Four times, once every two weeks**	2	**2**
Date/season reported (Score 2 for indoor systems) **Pesticide applications over eight weeks beginning June 17, 1991**	2	**2**
Test endpoints		
Species abundance reported **Zooplankton population structure reported**	3	**3**
Species diversity reported	3	**3**
Biomass reported **Macrophyte biomass**	2	**2**
Ecosystem recovery reported **Full recovery of all impacted taxa by study end**	2	**2**
Statistics		
Methods identified **ANOVA/Dunnett's Test**	2	**2**
At least 2 replicates **3**	3	**3**
At least 2 test concentrations and 1 control **5 plus 1 control**	3	**3**
Dose-response relationship observed	2	**2**
Hypothesis tests		
NOEC determined **Amphipod NOEC = 6 0.357 µg/L**	4	**4**
Significance level stated **0.05**	2	**2**
Minimum significant difference reported **Not reported**	2	**0**
% of control at NOEC and/or LOEC reported or calculable **Not reported**	2	**0**
Total **Reliability**	100	**93**

LOEC = lowest observed effect concentration, NOEC = no observed effect concentration.
[a]Compiled from RIVM 2001, USEPA 1985 and 2003a, ECOTOX 2006, CCME 1995, ANZECC and ARMCANZ 2000, OECD 1995a, and van der Hoeven et al. 1997.
[b]Weighting based on ECOTOX 2006 and on data quality criteria in RIVM 2001 and OECD 1995a.

Water Toxicity Data Summary

N. triangulifer

Study: Raby, M., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018c. Chronic toxicity of 6 neonicotinoid insecticides to *Chironomus dilutus* and *Neocloeon triangulifer*. Environmental toxicology and chemistry.

Relevance	Reliability
Score: 100	Score: 88.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018c	***N. triangulifer***
Parameter	**Value**	**Comment**
Test method cited	Soucek and Dickinson, 2015	New species used for toxicity testing
Phylum/subphylum	Arthropoda/insecta	
Class	Insecta	
Order	Ephemeroptera	
Family	Baetidae	
Genus	*Neocloeon*	
Species	*triangulifer*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h eggs	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	Until emergence, max. 32 d	
Data for multiple times?	Not reported	
Effect 1:	% survival to imago emergence	
Control response 1, mean (negative; solvent)	90 %	
Effect 2:	Days to imago emergence	
Control response 2, mean (negative; solvent)	22.3 d	
Temperature	23 ± 1 º C	
Test type	Static renewal	2/w
Photoperiod/light intensity	100-500 lux	
Dilution water	Dechlorinated tap water	
pH	8.4	

	Raby 2018c	***N. triangulifer***
Parameter	**Value**	**Comment**
Hardness	123 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	413 µS/cm	
Dissolved Oxygen	8.3 mg/L	
Feeding	0-14 d: *Navicula* sp. Diatoms 2/w 14-end: *Navicula* sp. biofilm *ad libitum*	
Purity of test substance	99.9 % 99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Mean 8.6 %	
Toxicity values calculated based on nominal or measured concentrations?	Corrected	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	5 concentrations, not all measured/reported	10 reps, 2/rep
Concentration 2 Nom; Meas (µg/L)	0.25; 0.32	10 reps, 2/rep
Concentration 3 Nom; Meas (µg/L)	0.5; 0.6	10 reps, 2/rep
Concentration 4 Nom; Meas (µg/L)	2; 2.40	10 reps, 2/rep
Concentration 5 Nom; Meas (µg/L)	Not reported	10 reps, 2/rep
Control 1 Nom; Meas (µg/L)	Negative: 0; 0	10 reps, 2/rep
EC_{50} (95% CI) (µg/L)	% survival to imago emergence: EC_{10}: 1.12 (0.49 – 1.76) EC_{25}: 1.42 (0.92 – 1.93) EC_{50}: 1.75 (1.42 – 2.09) EC_{90}: 2.33 (1.97 – 2.68) Days to imago emergence: EC_{50}: >2.11	Method:

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-13 =87

Acceptability: No prior contamination (4), Organisms randomized (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-10 =90

Reliability score: mean(87,90)=88.5

Water Toxicity Data Summary

N. triangulifer

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 85.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***N. triangulifer***
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/insecta	
Class	Insecta	
Order	Ephemeroptera	
Family	Baetidae	
Genus	*Neocloeon*	
Species	*triangulifer*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	95 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	95 % mobile	
Temperature	24.1 ± 1.92 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***N. triangulifer***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.7	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	363 µS/cm	
Dissolved Oxygen	8.4 mg/L	
Feeding	Navicula sp.: free diatoms	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 2.9 (2.0–3.7) LC_{50}: 5.2 (4.2–6.2)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 1.9 (1.4–2.4) EC_{50}: 3.1 (2.6–3.7)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-14 =86

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Temperature variation (3), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-15 =85

Reliability score: mean(86,85)=85.5

Water Toxicity Data Summary

O. mykiss

Study: Bowman, J., Bucksath, J. 1990b. Acute toxicity of NTN 33893 to rainbow trout (*Oncorhynchus mykiss*). Performed by Analytical Bio-Chemical Laboratories, Inc. Report number 100349. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42055315.

Relevance	Reliability
Score: 100	Score: 93
Rating: R	Rating: R

Relevance points taken off for: none.

	Bowman 1990b	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	Laboratory method based on EPA-660/3-75-009	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	1.07 g ± 0.19 44 mm ± 3	
Source of organisms	Mt. Lassen Trout Farm, Red Bluff, California	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Temperature	13 °C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 20 footcandles	
Dilution water	Soft blended water	Hard well water with demineralized/reverse

	Bowman 1990b	***O. mykiss***
Parameter	**Value**	**Comment**
		osmosis processed hard well water
pH	7.8	
Hardness	44 mg/L $CaCO_3$	
Alkalinity	54 mg/L	
Conductivity	110 µMhos/cm	
Dissolved Oxygen	9.1 mg/L	86 %
Feeding	Brine shrimp (Ocean Star International) and commercial fish food (Zeigler Bros., Inc.) daily	
Purity of test substance	95 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	66-100 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide, 1.5 mL	
Concentration 1 Nom; Meas (mg/L)	16; 15	10 reps, 1/rep
Concentration 2 Nom; Meas (mg/L)	27; 27	reps
Concentration 3 Nom; Meas (mg/L)	45; 42	reps
Concentration 4 Nom; Meas (mg/L)	75; 64	reps
Concentration 5 Nom; Meas (mg/L)	125; 83	reps
Control 1 Nom; Meas (mg/L)	0; 0	reps
Control 2 Nom; Meas (mg/L)	Dimethylformamide, 0; 0	reps
LC_{50} (95% CI) (mg/L)	>83	Method:
NOEC	42 mg/L	Method: visual inspection based on lack of mortality p: not reported MSD: not reported
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	100 %	10 (tmt) / 10 (mean controls) * 100 = %
Effect 1: % control at LOEC	Not calculable	

Notes: 83 mg/L appeared to be near solubility limit, which is contradictory to literature S values below.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100-6 =94

Acceptability: Temperature variation (3), Minimum significant difference (1), % control at LOEC (1), Point estimates (3). Total: 100- 8=92

Reliability score: mean(94,92)=93

Water Toxicity Data Summary

O. mykiss

Study: Cohle P., Bucksath, J. 1991. Early life stage toxicity of NTN 33893 technical to rainbow trout (*Oncorrhynchus mykiss*) in a flow-through system. Performed by Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri. Report number 101214. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42055320.

Relevance	Reliability
Score: 100	Score: 97.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	Proposed Recommended Bioassay Procedure for Egg and Fry Stages of Freshwater Fish, USEPA, 1972; Proposed New Standard Practice for Conducting Fish Early Life Stages Toxicity Tests, ASTM, 1983.	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<4 h	
Source of organisms	Mt. Lassen Trout Farm, Red Bluff, California	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	60 d post-hatch; 98 d	
Data for multiple times?	0, 1, 7 d, every 7 d	
Effect 1:	Hatch success	
Control response 1, mean (negative; solvent)	100 %	

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
Effect 2:	Percent swim-up	
Control response 2, mean (negative; solvent)	Negative: 47 d: 6.8 % 61 d: 97 % Solvent: 47 d: 0 % 61 d: 98 %	Additional days in report
Effect 3:	36 d post-hatch survival	
Control response 3, mean (negative; solvent)	Negative: 91.7 % Solvent: 100 %	
Effect 4:	60 d post-hatch survival	
Control response 4, mean (negative; solvent)	Negative: 91.7 % Solvent: 91.7 %	
Effect 5:	36 d post-hatch length	
Control response 5, mean (negative; solvent)	Negative: 26.9 mm Solvent: 27.8 mm	
Effect 6:	60 d post-hatch length	
Control response 6, mean (negative; solvent)	Negative: 38.1 mm Solvent: 39.8 mm	
Effect 7:	60 d post-hatch wet weight	
Control response 7, mean (negative; solvent)	Negative: 0.801 g Solvent: 0.916 g	
Test type	Flow through	
Photoperiod/light intensity	At 15-d post-hatch: 16 l: 8 d; 134 footcandles	
Dilution water	Deep well water processed by reverse osmosis blended with additional hard well water	
pH	7.8	
Hardness	40-50 mg/L $CaCO_3$	
Alkalinity	40-62 mg/L $CaCO_3$	
Conductivity	100-180 µMhos/cm	
Dissolved Oxygen	8.3 mg/L	77 %
Feeding	Began 18 d post-hatch: live brine shrimp and salmon starter 3/d	Shrimp: Ocean Star International, Inc., Snowville, Utah Salmon starter: Zeigler Brothers, Inc.
Purity of test substance	Batch 1: 95.4 % Batch 2: 94.7 %	Batch 1: 0-84 d Batch 2: 85-98 d
Concentrations measured?	Yes	
Measured is what % of nominal?	>92 %	

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide, 0.014-0.015 mL/L	
Concentration 1 Nom; Meas (mg/L)	1.3; 1.2	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Concentration 2 Nom; Meas (mg/L)	2.5; 2.3	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Concentration 3 Nom; Meas (mg/L)	5.0; 4.9	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Concentration 4 Nom; Meas (mg/L)	10; 9.8	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Concentration 5 Nom; Meas (mg/L)	19; 20	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Control 1 Nom; Meas (mg/L)	Negative: 0; 0	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
Control 2 Nom; Meas (mg/L)	Solvent: 0; 0	4 reps, 35 eggs/rep until day 38 when reduced to 15 fry/rep
NOEC	9.8 mg/L	Based on hatchability, fry survival, and "fry growth" (length and weight) Method: ANOVA p: 0.05 MSD: not reported
LOEC	19 mg/L	Based on hatchability, fry survival, and "fry

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
		growth" (length and weight)
MATC (GeoMean NOEC, LOEC)	14 mg/L	Based on hatchability, fry survival, and "fry growth" (length and weight)
Effect 1: % control at NOEC	100 %	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 1: % control at LOEC	100 %	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 2: % control at NOEC	Percent swim-up Negative: 47 d: 0 % 61 d: 91 % Solvent: 47 d: not calculable 61 d: 86 %	Negative: 47 d: 0 (tmt) / 6.8 (mean controls) * 100 = 0 % 61 d: 88 (tmt) / 97 (mean controls) * 100 = 91 % Solvent: 47 d: 0 (tmt) / 0 (mean controls) * 100 = not calculable 61 d: 84 (tmt) / 98 (mean controls) * 100 = 86 %
Effect 2: % control at LOEC	Negative: 47 d: 0 % 61 d: 87 % Solvent: 47 d: not calculable 61 d: 86 %	Negative: 47 d: 0 (tmt) / 6.8 (mean controls) * 100 = 0 % 61 d: 84 (tmt) / 97 (mean controls) * 100 = 87 % Solvent: 47 d: 0 (tmt) / 0 (mean controls) * 100 = not calculable 61 d: 84 (tmt) / 98 (mean controls) * 100 = 86 %

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
Effect 3: % control at NOEC	36 d post-hatch survival Negative: 102 % Solvent: 93 %	Negative: 93.3 (tmt) / 91.7 (mean controls) * 100 = 102 % Solvent: 93.3 (tmt) / 100 (mean controls) * 100 = 93.3 %
Effect 3: % control at LOEC	Negative: 93 % Solvent: 85 %	Negative: 85.0 (tmt) / 91.7 (mean controls) * 100 = 93 % Solvent: 85.5 (tmt) / 100 (mean controls) * 100 = 85 %
Effect 4: % control at NOEC	60 d post-hatch survival Negative: 102 % Solvent: 93 %	Negative: 93.3 (tmt) / 91.7 (mean controls) * 100 = 102 % Solvent: 93.3 (tmt) / 100 (mean controls) * 100 = %
Effect 4: % control at LOEC	Negative: 82 % Solvent: 82 %	Negative: 81.7 (tmt) / 100 (mean controls) * 100 = 81.7 % Solvent: 81.7 (tmt) / 100 (mean controls) * 100 = 81.7 %
Effect 5: % control at NOEC	36 d post-hatch length Negative: 99 % Solvent: 96 %	Negative: 26.7 (tmt) / 26.9 (mean controls) * 100 = 99 % Solvent: 26.7 (tmt) / 27.8 (mean controls) * 100 = 96 %
Effect 5: % control at LOEC	Negative: 94 % Solvent: 91 %	Negative: 25.4 (tmt) / 26.9 (mean controls) * 100 = 94 % Solvent: 25.4 (tmt) / 27.8 (mean

	Cohle 1991	***O. mykiss***
Parameter	**Value**	**Comment**
		controls) * 100 = 91 %
Effect 6: % control at NOEC	60 d post-hatch length Negative: 99 % Solvent: 38 %	Negative: 37.6 (tmt) / 38.1(mean controls) * 100 = 99 % Solvent: 37.6 (tmt) / (mean controls) * 100 = 38 %
Effect 6: % control at LOEC	Negative: 93 % Solvent: 89 %	Negative: 35.6 (tmt) / 38.1(mean controls) * 100 = 93 % Solvent: 35.6 (tmt) / 39.8 (mean controls) * 100 = 89 %
Effect 7: % control at NOEC	60 d post-hatch wet weight Negative: 94 % Solvent: 82 %	Negative: 0.752 (tmt) / 0.801 (mean controls) * 100 = 94 % Solvent: 0.752 (tmt) / 0.916 (mean controls) * 100 = 82 %
Effect 7: % control at LOEC	Negative: 81 % Solvent: 71 %	Negative: 0.648 (tmt) / 0.801 (mean controls) * 100 = 81 % Solvent: 0.648 (tmt) / 0.916 (mean controls) * 100 = 71 %

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Minimum significant difference (2). Total: 100-2 =98

Acceptability: Temperature variation (3). Total: 100- 3=97

Reliability score: mean(98,97)=97.5

Water Toxicity Data Summary

O. mykiss

Study: Grau, R. The acute toxicity of NTN 33893 technical to rainbow trout (*Salmo gairdneri*) in a static test. 1988. Bayer AG Institute for Environmental Biology technical report number 101303. Submitted to Mobay Corporation Agricultural Chemicals Division, Kansas City, Missouri. CA DPR 120363 (DPN 51950-0045).

Relevance	Reliability
Score: 100	Score: 92
Rating: R	Rating: R

Relevance points taken off for: none

	Grau, R.	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	USEPA-FIFRA, 40 CFR, Section 158.145, Guideline 72-1	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	1.3 ± 0.6 g	
Source of organisms	Forellenzucht Linn, D-5940 Lennestadt, FRG	Commercial fishery
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	3, 24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Behavior (apathy, irregular swimming, lying on side, staggering)	
Control response 2, mean (negative; solvent)	100% normal	

	Grau, R.	***O. mykiss***
Parameter	**Value**	**Comment**
Temperature	15.4 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	16 l : 8 d	
Dilution water	Reconstituted water	
pH	8 ± 0.1	
Hardness	230 mg/L $CaCO_3$	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	9.9-10.8 mg/L	99 %
Feeding	Commercial fish diet (Tetramine) up to 48 h prior to testing	
Purity of test substance	95.3 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	107-111 %	<80 % only in highest concentration
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	0 h: 50; 53.4 24 h not agitated: 50; 51.5 96 h: 50; 51.8 96 h not agitated: 50; 51.8	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	0 h: 89; 98.9 24 h not agitated: 89; 91.4 96 h: 89; 100.5 96 h not agitated: 50; 51.8	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	0 h: 158; 176 24 h not agitated: 158; 167 96 h: 158; 162 96 h not agitated: 158; 174	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	0 h: 281; 304 24 h not agitated: 281; 298 96 h: 281; 306 96 h not agitated: 281; 328	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	0 h: 500; 533 24 h not agitated: 500; 400 96 h: 500; not reported 96 h not agitated: 500; not reported	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	0; not detected	1 rep, 10/rep

	Grau, R.	***O. mykiss***
Parameter	**Value**	**Comment**
LC_{50} (95% CI) (mg/L)	24 h: 265 (220-320) 48, 72, 96 h: 211 (158-281)	Method: Thompson and Weil
NOEC	50 mg/L	Method: Not reported p: Not reported MSD: Not reported
LOEC	281 mg/L	
MATC (GeoMean NOEC, LOEC)	119	
Effect 1: % control at NOEC	3 h: 100 % survival 24 h: 100 % survival 48 h: 100 % survival 72 h: 100 % survival 96 h: 100 % survival	
Effect 1: % control at LOEC	3 h: 100 % survival 24 h: 40 % survival 48 h: 0 % survival 72 h: Not reported 96 h: Not reported	24 h: 4 survived (tmt) / 10 survived (control) = 40 % survival
Effect 2: % control at NOEC	All h: 100 % survival	
Effect 2: % control at LOEC	3 h: 100 % irregular swimming 24 h: 100 % lying on side, apathy 48 h: 0 % survival 72 h: 100 % but behavior not reported 96 h: Not reported	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Alkalinity (2), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100- 10=90

Acceptability: Alkalinity (2), Conductivity (1), Adequate replication (2), Minimum significant difference (1). Total: 100-6 94=

Reliability score: mean(90,94)=92

Water Toxicity Data Summary

O. mykiss

Study: Gries, T. 2002. Early life-stage toxicity test with rainbow trout (*Oncorhynchus mykiss*) under flow-through conditions. Performed by Springborn Smithers Laboratories (Europe) AG, Horn, Switzerland. Study number 1022.016.321. Submitted by Bayer AG Bayer CropScience, Monheim, Germany. USEPA MRID 4962703.

Relevance	Reliability
Score: 100	Score: 95
Rating: R	Rating: R

Relevance points taken off for: none.

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	OECD #210, USEPA-OPPTS 850.1400, USEPA FIFRA 72-4	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Fertilized eggs	
Source of organisms	Forellenhof Mandli, Liestal, Switzerland	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	5-5.5 h	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	91 d	
Data for multiple times?	Yes	
Effect 1:	Time to hatch	Tabulated data for % hatch on day 29
Control response 1, mean (negative; solvent)	Day 29: 21 %	
Effect 2:	Hatching rate (31 d)	
Control response 2, mean (negative; solvent)	91 %	
Effect 3:	Larval deformities (45 d)	

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	Data not reported	
Effect 4:	Larval survival: (45 d):	
Control response 4, mean (negative; solvent)	Data not reported	
Effect 5:	Time to swim-up on days 40-43: 0 % 44: 10 % 45: 7 % 46: 14 % 47: 19 % 48 20 % 49: 51%	Data only for % swim up by given day
Control response 5, mean (negative; solvent)	98 %	
Effect 6:	Swim-up on 52 d	
Control response 6, mean (negative; solvent)	98 %	
Effect 7:	Behavioral changes	
Control response 7, mean (negative; solvent)	Data not reported	
Effect 8:	Post hatch survival (91 d)	
Control response 8, mean (negative; solvent)	Data not reported	
Effect 9:	Wet weight (91 d)	
Control response 9, mean (negative; solvent)	Data not reported	
Effect 10:	Dry weight (91 d)	
Control response 10, mean (negative; solvent)	Data not reported	
Effect 11:	Deformities at end of exposure	
Control response 11, mean (negative; solvent)	Data not reported	
Temperature	10.2 ± 1.3 ºC	
Test type	Flow-through	
Photoperiod/light intensity	0-37 d: darkness 37 91 d: 16 l: 8 d; 400-580 lux	
Dilution water	Deionized well water	
pH	7.3	
Hardness	156-192 mg/L $CaCO_3$	
Alkalinity	26-32 mg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	6.42-11.01 mg/L	60-102 %

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
Feeding	*Artemi salina* cysts	
Purity of test substance	98.2 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	89-113 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	0.1; 0.0994	2 reps, 50 eggs then 30 larvae/rep
Concentration 2 Nom; Meas (mg/L)	0.3; 0.307	2 reps, 50 eggs then 30 larvae/rep
Concentration 3 Nom; Meas (mg/L)	1.0; 0.977	2 reps, 50 eggs then 30 larvae/rep
Concentration 4 Nom; Meas (mg/L)	3.0; 3.14	2 reps, 50 eggs then 30 larvae/rep
Concentration 5 Nom; Meas (mg/L)	9.2; 9.02	2 reps, 50 eggs then 30 larvae/rep
Concentration 6 Nom; Meas (mg/L)	27.0; 26.9	2 reps, 50 eggs then 30 larvae/rep
Control 1 Nom; Meas (mg/L)	0; 0	2 reps, 50 eggs then 30 larvae/rep
NOEC	Time to hatch: 9.02 Hatching rate (31 d): ≥26.9 Larval deformities (45 d): ≥26.9 Larval survival: (45 d): ≥26.9 Time to swim-up on days 40,42-49: 9.02 Swim-up on 52 d: ≥26.9 Behavioral changes: ≥26.9 Post hatch survival (91 d): ≥26.9 Length (91 d): ≥26.9 Wet weight (91 d): ≥26.9 Dry weight (91 d): ≥26.9 Deformities at end of exposure: ≥26.9	Method: Williams test p: 0.05 MSD: not reported
LOEC	Time to hatch: 26.9 Hatching rate (31 d): >26.9	

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
	Larval deformities (45 d): >26.9 Larval survival: (45 d): >6.9 Time to swim-up on days 40,42-49: 26.9 Swim-up on 52 d: >26.9 Behavioral changes: >26.9 Post hatch survival (91 d): >26.9 Length (91 d): >26.9 Wet weight (91 d): >26.9 Dry weight (91 d): >26.9 Deformities at end of exposure: >26.9	
MATC (GeoMean NOEC, LOEC)	Time to hatch: 15.6 Hatching rate (31 d): not calculable Larval deformities (45 d): not calculable Larval survival: (45 d): not calculable Time to swim-up on days 40,42-49: 15.6 Swim-up on 52 d: not calculable Behavioral changes: not calculable Post hatch survival (91 d): not calculable Length (91 d): not calculable Wet weight (91 d): not calculable Dry weight (91 d): not calculable Deformities at end of exposure: not calculable	
Effect 1: % control at NOEC	Time to hatch; tabulated data for % hatch on day 29 181 %	38 (tmt) / 21 (mean controls) * 100 = 181 %
Effect 1: % control at LOEC	390 %	82 (tmt) / 21 (mean controls) * 100 = 390 %
Effect 2: % control at NOEC	Hatching rate (31 d):	

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
	Not calculable	
Effect 2: % control at LOEC	Not calculable	
Effect 3: % control at NOEC	Larval deformities (45 d): not calculable	
Effect 3: % control at LOEC	Not calculable	
Effect 4: % control at NOEC	Larval survival: (45 d): not calculable	
Effect 4: % control at LOEC	Not calculable	
Effect 5: % control at NOEC	Time to swim-up on days 40, 42-43: not calculable 44: 150 % 45: 143 % 46: 129 % 47: 121 % 48: 185 % 49: 147 %	Data only for % swim up by given day 40: 5 (tmt) / 0 (mean controls) * 100 = NA 42: 0 (tmt) / 0 (mean controls) * 100 = NA 43: 2 (tmt) / 0 (mean controls) * 100 = NA 44: 15 (tmt) / 10 (mean controls) * 100 = 150 % 45: 10 (tmt) / 7 (mean controls) * 100 = 143 % 46: 18 (tmt) / 14 (mean controls) * 100 = 129 % 47: 23 (tmt) /19(mean controls) * 100 = 121 % 48: 37 (tmt) / 20 (mean controls) * 100 = 185 % 49: 75 (tmt) / 51 (mean controls) * 100 = 147 %
Effect 5: % control at LOEC	Time to swim-up on days 40, 42-43: not calculable 44: 610 % 45: 629 % 46: 500 % 47: 368 % 48: 375 %	Data only for % swim up by given day 40: 14 (tmt) / 0 (mean controls) * 100 = NA

	Gries 2002	***O. mykiss***
Parameter	**Value**	**Comment**
	49: 186 %	42: 30 (tmt) / 0 (mean controls) * 100 = NA 43: 61 (tmt) / 0 (mean controls) * 100 = NA 44: 61 (tmt) / 10 (mean controls) * 100 = 610 % 45: 44 (tmt) / 7 (mean controls) * 100 = 629 % 46: 70 (tmt) / 14 (mean controls) * 100 = 500 % 47: 70 (tmt) /19 (mean controls) * 100 = 368 % 48: 75 (tmt) / 20 (mean controls) * 100 = 375 % 49: 95 (tmt) / 51 (mean controls) * 100 = 186 %
Effect 6: % control at NOEC	Swim-up on 52 d: Not calculable	
Effect 6: % control at LOEC	Not calculable	
Effect 7: % control at NOEC	Behavioral changes: not calculable	
Effect 7: % control at LOEC	Not calculable	
Effect 8: % control at NOEC	Post hatch survival (91 d): not calculable	
Effect 8: % control at LOEC	Not calculable	
Effect 9: % control at NOEC	Wet weight (91 d): not calculable	
Effect 9: % control at LOEC	Not calculable	
Effect 10: % control at NOEC	Dry weight (91 d): not calculable	
Effect 10: % control at LOEC	Not calculable	
Effect 11: % control at NOEC	Deformities at end of exposure: not calculable	
Effect 11: % control at LOEC	Not calculable	

Notes: Much of the data associated with reported NOEC/LOEC values is graphical and not tabulated, preventing % control calculations.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Conductivity (2), Minimum significant difference (2). Total: 100-4 =96

Acceptability: Conductivity (1), Minimum significant difference (1), Point estimates (3). Total: 100- 5=95

Reliability score: mean(96,95)=95.5

Water Toxicity Data Summary

P. nigromaculatus

Study: Feng, S., Kong, Z., Wang, X., Zhao, L. and Peng, P., 2004. Acute toxicity and genotoxicity of two novel pesticides on amphibian, Rana N. Hallowell. Chemosphere, 56(5), pp.457-463.

Relevance	Reliability
Score: 100	Score: 69
Rating: R	Rating: R

Relevance points taken off for: none.

	Feng 2004	***P. nigromaculatus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Ranidae	
Genus	*Pelophylax*	
Species	*nigromaculatus*	
Family native to North America?	Yes, and species introduced for biocontrol in Hawaii	https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=73
Age/size at start of test/growth phase	Tadpole, 1.5 m old, 37.5 mm, 461 mg	
Source of organisms	Collected from Zhijing Mountain area	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	7 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Temperature	20 ± 1 º C	
Test type	Static-renewal	24 h
Photoperiod/light intensity	Not reported	
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	

	Feng 2004	***P. nigromaculatus***
Parameter	**Value**	**Comment**
Conductivity	Not reported	
Dissolved Oxygen	>8.5 mg/L	> 93.5 %
Feeding	Not reported	
Purity of test substance	95 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	30; not reported	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	45; not reported	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	67.5; not reported	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	101.2; not reported	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	151.8; not reported	1 rep, 10/rep
Concentration 6 Nom; Meas (mg/L)	227.8; not reported	1 rep, 10/rep
Concentration 7 Nom; Meas (mg/L)	341.7; not reported	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	0.64 % NaCl for osmotic equibalance	1 rep, 10/rep
LC_{50} (95% CI) (mg/L)	24 h: 268 (226-318) 48 h: 219 (153-313) 72 h: 177 (160-200) 96 h: 129 (115-145)	Method: Trimmed Spearman-Karber

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-30 =70

Acceptability: Standard method (5), Measured concentrations within 20% nominal (4), No prior contamination (4), Organisms randomized (1), Dilution water (2), Hardness (2),

Alkalinity (2), Conductivity (1), pH (2), Photoperiod (2), Adequate replication (2), Random design (2), Minimum significant difference (1), % control at NOEC (1),
% control at LOEC (1). Total: 100- 32=68

Reliability score: mean(70,68)=69

Water Toxicity Data Summary

Simulium vittatum
Fipronil
MB 46030

Overmyer JP, Mason BN and Armbrust KL. (2005) Acute toxicity of imidacloprid and fipronil to a nontarget aquatic insect, *Simulium vittatum* Zetterstedt cytospecies IS-7. *Bulletin of environmental contamination and toxicology*, 74(5), 872-879.

Relevance	Reliability
Score: 100	Score: 87.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Overmyer 2005	***S. vittatum***
Parameter	**Value**	**Comment**
Test method cited	Overmyer 2003	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Simuliidae	
Genus	*Simulium*	
Species	*vittatum*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	5^{th} instar larvae	
Source of organisms	University of Georgia, Athens, Georgia	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>96 %	
Temperature	20 ± 1 ºC	
Test type	Static	
Photoperiod/light intensity	16l:8d	
Dilution water	Moderately hard water	Weber 1993
pH	7.3-7.7	
Hardness	92.0 mg/L $CaCO_3$	
Alkalinity	66.7 mg/L $CaCO_3$	
Conductivity	273-275 umhos/cm	

	Overmyer 2005	***S. vittatum***
Parameter	**Value**	**Comment**
Dissolved Oxygen	8.8-8.9 mg/L	
Feeding	5 mL food suspension to 140 mL water	
Purity of test substance	>98 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	112-120 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Cited reference followed	
Concentration of carrier (if any) in test solutions	Acetone, concentration not reported	
Concentration 1 Nom; Meas (µg/L)	2.00; 2.28	3 reps, number not reported/rep
Concentration 2 Nom; Meas (µg/L)	4.00; 4.89	
Concentration 3 Nom; Meas (µg/L)	6.00; 7.25	
Concentration 4 Nom; Meas (µg/L)	8.00; 9.52	
Concentration 5 Nom; Meas (µg/L)	10.00; 11.19	
Concentration 6 Nom; Meas (µg/L)	12.00; 14.24	
Control	Negative Solvent	
LC_{50} (95% CI) (µg/L)	3 separate tests performed: 1. 6.75 (6.04-7.41) 2. 8.25 (7.56-8.87) 3. 9.54 (8.71-10.57)	Method: logistic

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-8 =92

Acceptability: Measured concentrations within 20% nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-17 =83

Reliability score: mean(92, 83)=87.5

Water Toxicity Data Summary

Stenelmis sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 84.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Stenelmis* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum		
Class		
Order		
Family		
Genus		
Species		
Family native to North America?		
Age/size at start of test/growth phase	Not reported	
Source of organisms	Speed River, Eramosa River, Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	90 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	90 % mobile	
Temperature	14.5 ± 0.05 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Stenelmis* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	374 µS/cm	
Dissolved Oxygen	7.8 mg/L	
Feeding	1.25mL 3:2 ratio cereal grass: ground Nutrafin	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥6 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 35.1 (–20.8–91.1) LC_{50}: 365.7 (107.1–624.2)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{10}: 44.6 (17.6–71.7) EC_{50}: 99.2 (66.9–131.6)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-19 =81

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-12 =88

Reliability score: mean(81,88)=84.5

Water Toxicity Data Summary

Trichocorixa sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 100	Score: 88
Rating: R	Rating: R

Relevance points taken off for: none.

	Raby 2018a	***Trichocorixa* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Arthropoda/hexapoda	
Class	Insecta	
Order	Hemiptera	
Family	Corixidae	
Genus	*Trichocorixa*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Quiet eddies of Speed River and ponds in Guelph, Ontario	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	15.2 ± 2.42 º C	
Test type	Static	

	Raby 2018a	***Trichocorixa* sp.**
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	
Dilution water	Dechlorinated municipal tap water	Nitex screen
pH	8.1	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	322 µS/cm	
Dissolved Oxygen	10.1 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{10}: 139.4 (51.4–227.4) LC_{50}: 450.4 (274.0–626.7)	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: 63.1 (44.6–89.2)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Temperature (4), Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-18 =82

Acceptability: Temperature variation (3), Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-15 =85

Reliability score: mean(82,85)=83.5

Appendix A2 – Wildlife Toxicity Studies Rated R

Water Toxicity Data Summary

A. platyrhynchos

Study: Hancock, G. A. 1996. NTN 33893 technical: an acute oral LD_{50} with mallards. Performed by Bayer Corporation Agricultural Division, Kansas City, Missouri. Report number 107351.Submitted by by Bayer Corporation Agricultural Division, Stillwell, Kansas. CDPR 148335 (DPN 51950-0273).

Reliability
Score: 82
Rating: R

	Hancock 1996	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Test method cited	FIFRA Guideline 71-1	
Phylum/subphylum	Chordata	
Class	Aves	
Order	Anseriformes	
Family	Anatidae	
Genus	*Anas*	
Species	*platyrhynchos*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	19 w	
Source of organisms	Whistling Wings, Inc., Hanover, Illinois	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	18 d	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	14 d	
Data for multiple times?		
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Exhibiting toxic signs	
Control response 2, mean (negative; solvent)	100 % normal	
Effect 3:	Time to mortality	
Control response 3, mean (negative; solvent)	>14 d	
Effect 4:	Histopathological changes	

	Hancock 1996	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Control response 4, mean (negative; solvent)	100 % normal but only 2 of 6 examined	Lesions present
Effect 5:	Mean body weight change	
Control response 5, mean (negative; solvent)	Female: 1-8 d: 2 g 1-15 d: 13 g Male: 1-8 d: 18 g 1-15 d: 17 g	
Effect 6:	Mean feed consumption	
Control response 6, mean (negative; solvent)	Female: 56.1 g/bird/d Male: 74.7 g/bird/d	
Temperature	21 °C	
Test type	Oral	
Photoperiod/light intensity	8 l: 16 d	
Feeding	Agway Gamebird Ration	*Ad libitum* except 20 h prior to dosing
Purity of test substance	96.6 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/kg)	25; not reported	6 reps (3 male+3 female), 1/rep
Concentration 2 Nom; Meas (mg/kg)	50; not reported	6 reps (3 male+3 female), 1/rep
Concentration 3 Nom; Meas (mg/kg)	100; not reported	6 reps (3 male+3 female), 1/rep
Concentration 4 Nom; Meas (mg/kg)	200; not reported	6 reps (3 male+3 female), 1/rep
Concentration 5 Nom; Meas (mg/kg)	400; not reported	6 reps (3 male+3 female), 1/rep
Concentration 6 Nom; Meas (mg/kg)	800; not reported	6 reps (3 male+3 female), 1/rep
Control 1 Nom; Meas (mg/kg)	0; not reported	6 reps (3 male+3 female), 1/rep
LC_{50} (95% CI) (mg/kg)	283 (182-439)	Method: probit
NOEC	<25 mg/kg	Method: not reported p: not reported

	Hancock 1996	***A. platyrhynchos***
Parameter	**Value**	**Comment**
		MSD: not reported
LOEC	25 mg/kg	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	Not calculable	
Effect 1: % control at LOEC	100 % survival	6 (tmt) / 6 (mean controls) * 100 =100 %
Effect 2: % control at NOEC	Not calculable	
Effect 2: % control at LOEC	33 % normal	2 (tmt) / 6 (mean controls) * 100 = 33 %
Effect 3: % control at NOEC	Not calculable	
Effect 3: % control at LOEC	100 % survival to 14 d	14 (tmt) / 14 (mean controls) * 100 = 100 %
Effect 4: % control at NOEC	Not calculable	
Effect 4: % control at LOEC	100 % observed (lesions)	2 (tmt) / 2 (mean controls) * 100 = 100 %
Effect 5: % control at NOEC	Female: 1-8 d: 50 % 1-15 d: 100 % Male: 1-8 d: -61 % 1-15 d: -67 %	Female: 1-8 d: 1 (tmt) / 2 (mean controls) * 100 = 50 % 1-15 d: 2 (tmt) / 2 (mean controls) * 100 = 100 % Male: 1-8 d: -11 (tmt) / 18 (mean controls) * 100 = -61 % 1-15 d: -12 (tmt) / 18 (mean controls) * 100 = -67 %
Effect 5: % control at LOEC	Not calculable	
Effect 6: % control at NOEC	Female: 103 % Male: 93 %	Female: 58 (tmt) / 56.1 (mean controls) * 100 = 103 % Male:

	Hancock 1996	***A. platyrhynchos***
Parameter	**Value**	**Comment**
		69.7 (tmt) / 74.7 (mean controls) * 100 = 93 %
Effect 6: % control at LOEC	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation and acceptability for terrestrial laboratory/field data: Chemical analysis method (5), Statistical significance (5), Significance level (5), Minimum significant difference (3). Total: 100- 18=82

Water Toxicity Data Summary

A. platyrhynchos

Study: Hancock, G.A. 1994. Effect of technical NTN 33893 on eggshell quality in mallards. Performed by Miles Incorporated Agriculture Division, Stilwell, Kansas. Report number 106623. Submitted to Miles Incorporated Agriculture Division, Kansas City, Missouri. USEPA MRID 43466501.

Reliability
Score: 99
Rating: R

	Hancock 1994	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Test method cited	FIFRA 71-4 Avian Reproduction	
Phylum/subphylum	Chordata	
Class	Aves	
Order	Anseriformes	
Family	Anatidae	
Genus	*Anas*	
Species	*Platyrhynchos*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adult	
Source of organisms	Whistling Wings, Hanover, Illinois	
Have organisms been exposed to contaminants?	Not	
Animals acclimated and disease-free?	34 d	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	19 w	
Data for multiple times?		
Effect 1:	Adult body weight at termination	
Control response 1, mean (negative; solvent)	4	Units not reported
Effect 2:	Adult feed consumption	
Control response 2, mean (negative; solvent)	117	Units not reported
Effect 3:	Eggshell thickness	

	Hancock 1994	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	0.362 mm	
Effect 4:	Eggshell strength	
Control response 4, mean (negative; solvent)	2.87 kg	
Temperature	70 ± º C	
Test type	Dietary	
Photoperiod/light intensity	0-7 w: 7 l: 17 d 8-19 w: 17 l: 7 d 6 footcandles	
Feeding	Agway Game Bird Ration, *ad libitum*	
Purity of test substance	96 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	85-88 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Acetone (150 mL/16 kg feed) and corn oil (160 g/16 kg feed)	
Concentration 1 Nom; Meas (mg/kg)	25; 22	1 reps, 15 male+15 female/rep
Concentration 2 Nom; Meas (mg/kg)	40; 35	1 reps, 15 male+15 female/rep
Concentration 3 Nom; Meas (mg/kg)	55; 47	1 reps, 15 male+15 female/rep
Control 1 Nom; Meas (mg/kg)	0; 0	1 reps, 15 male+15 female/rep
NOEC	47 mg/kg	Method: ANOVA p: 0.05 MSD: not reported
LOEC	>47 mg/kg	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	Adult body weight at termination Male: 97 % Female: 98 %	Male: 1250 (tmt) / 1212 (mean controls) * 100 = 97 % Female: 1315 (tmt) / 1338 (mean controls) * 100 = 98 %

	Hancock 1994	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Effect 1: % control at LOEC	Not calculable	
Effect 2: % control at NOEC	Adult feed consumption 95 %	111 (tmt) / 117 (mean controls) * 100 = 95 %
Effect 2: % control at LOEC	Not calculable	
Effect 3: % control at NOEC	Eggshell thickness 100 %	0.361 (tmt) / 0.362 (mean controls) * 100 = 100 %
Effect 3: % control at LOEC	Not calculable	
Effect 4: % control at NOEC	Eggshell strength 97 %	2.78 (tmt) / 2.87 (mean controls) * 100 = 97 %
Effect 4: % control at LOEC	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation and acceptability for terrestrial laboratory/field data: Minimum significant difference (1). Total: 100-1 =99

Appendix A3 – Studies rated RL, LR, LL

Water Toxicity Data Summary

B. rhodani

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 100	Score: 63
Rating: R	Rating: L

Relevance points taken off for: none.

	Beketov 2008	***B. rhodani***
Parameter	**Value**	**Comment**
Test method cited	OECD 1997	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Baetidae	
Genus	*Baetis*	
Species	*rhodani*	
Family native to North America?	Arthropoda/Crustacea	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Stream mesocosms on university campus	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	15 ± 2 º C	
Test type	Static	
Photoperiod/light intensity	10 l: 14 d	
Dilution water	M7 medium	
pH	7.4	
Hardness	180 mg/L $CaCO_3$	
Alkalinity	Not reported	
Conductivity	600 µS/cm	
Dissolved Oxygen	Not reported	

	Beketov 2008	***B. rhodani***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	Analytical grade	
Concentrations measured?	No	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	DMSO, <1 %	
Concentration 1 Nom; Meas (µg/L)	Number and values not reported	Reps not reported, 10/rep
Control 1 Nom; Meas (µg/L)	Solvent	Reps not reported, 10/rep
LC_{50} (95% CI) (µg/L)	8.49 (4.45–16.20)	Method: Trimmed Spearman–Karber

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-24 =76

Acceptability: Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), Number of concentrations (3), Random design (2), Adequate replication (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-41 =59

Reliability score: mean(76,59)=67.5

Water Toxicity Data Summary

C. brevilineata

Study: Yokoyama, A., Ohtsu, K., Iwafune, T., Nagai, T., Ishihara, S., Kobara, Y., Horio, T. and Endo, S., 2009. Sensitivity difference to insecticides of a riverine caddisfly, Cheumatopsyche brevilineata (Trichoptera: Hydropsychidae), depending on the larval stages and strains. Journal of Pesticide Science, 34(1), pp.21-26.

Relevance	Reliability
Score: 92.5	Score: 64
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.7

	Yokoyama 2009	***C. brevilineata***
Parameter	**Value**	**Comment**
Test method cited	Not reported	Following method of previous paper that itself establishes new method for caddisfly on basis that existing methods test less sensitive species
Phylum/subphylum	Euarthropoda	
Class	Insecta	
Order	Trichoptera	
Family	Hydropsychidae	
Genus	*Cheumatopsyche*	
Species	*brevilineata*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	First instar: <24 h Second instar Third instar Fourth instar Fifth instar	Separate tests for each instar
Source of organisms	Strain M: Miya River, Yokohama, Kanagawa, Japan Strain K: Kokura River, Ishioka, Ibaraki prefecture, Japan	
Have organisms been exposed to contaminants?	Possibly because field collected	

	Yokoyama 2009	***C. brevilineata***
Parameter	**Value**	**Comment**
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	No	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	20 º C	
Test type	Static	
Photoperiod/light intensity	Continuous; 4000 lux	
Dilution water	Filtered, dechlorinated tap water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	Analytical grade	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	≤0.1 % acetone	
Concentration 1 Nom; Meas (mg/L)	Concentrations not reported	First-third instar: 20 reps, 1/rep Fourth-fifth instar: 2 reps, 5/rep
EC_{50} (95% CI) (µg/L)	Strain M: First instar: 6.64 Fifth instar: 37.9 Strain K: First instar: 6.54 Fifth instar: 33.3	Method: logistic regression

Notes: Relevance points not deducted for standard method because it uses method of previous paper that itself establishes new method for caddisfly on basis that existing methods test less sensitive species

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 28=72

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), No prior contamination (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-44 =56

Reliability score: mean(72,56)=64

Water Toxicity Data Summary

C. riparius

Study: Naveen, N.C., Fojtova, D., Blahova, L., Rozmankova, E. and Blaha, L., 2018. Acute and (sub) chronic toxicity of the neonicotinoid imidacloprid on Chironomus riparius. Chemosphere. 209: 568-577.

Relevance	Reliability
Score: 100	Score: 84.5
Rating: R	Rating: R

Relevance points taken off for: none.

	Chandran 2018	***C. riparius***
Parameter	**Value**	**Comment**
Test method cited	OECD Guideline 219, 2004	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*riparius*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	3 d, first instar larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	28 d	
Data for multiple times?	No	
Effect 1:	Emergence	
Control response 1, mean (negative; solvent)	74 %	Valid according to OECD guideline
Temperature	20 ± 0.5 º C	
Test type	Static-renewal	3 d
Photoperiod/light intensity	Not reported	
Dilution water	Dechlorinated tap water	
pH	7.65-8.37	
Hardness	Not reported	
Alkalinity	Not reported	

	Chandran 2018	***C. riparius***
Parameter	**Value**	**Comment**
Conductivity	401-532 S/cm	
Dissolved Oxygen	98-104 %	
Feeding	Not reported	
Purity of test substance	99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	83-96 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	0.0625; not reported	5 reps, 20/rep
Concentration 2 Nom; Meas (µg/L)	0.125; 0.120 (mean all days)	5 reps, 20/rep
Concentration 3 Nom; Meas (µg/L)	0.625; 0.521 (mean all days)	5 reps, 20/rep
Control (µg/L)	0; <LOQ	5 reps, 20/rep
NOEC	Emergence time 0.125	Method: Dunnett's test p: MSD:
LOEC	0.625	
MATC (GeoMean NOEC, LOEC)	0.280	
Effect 1: % control at NOEC	Cumulative adult emergence (28 d): 80 % Adult female (28 d): 97 % Adult male (28 d): 103 %	Cumulative adult emergence (28 d): 59.38 (tmt) / 73.96 (control) * 100 = 80 % Adult female (28 d): 43.64 (tmt) / 45.07 (control) * 100 = 97 % Adult male (28 d): 56.36 (tmt) / 54.93 (control) * 100 = 103 %
Effect 1: % control at LOEC	Cumulative adult emergence (28 d): 86 %	Cumulative adult emergence (28 d):

	Chandran 2018	***C. riparius***
Parameter	**Value**	**Comment**
	Adult female (28 d): 102 % Adult male (28 d): 99 %	63.44 (tmt) / 73.96 (control) * 100 = 86 % Adult female (28 d): 45.76 (tmt) / 45.07 (control) * 100 = 102 % Adult male (28 d): 54.24 (tmt) / 54.93 (control) * 100 = 99 %

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Photoperiod (3), Minimum significant difference (2), Point estimates (8). Total: 100-17 =83

Acceptability: Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Photoperiod (2), Minimum significant difference (1), Point estimates (3). Total: 100-14 =86

Reliability score: mean(83,86)=84.5

Water Toxicity Data Summary

C. tentans
Imidacloprid metabolite
6-chloronicotinic acid

Study: Bowers, L.M., Lam, C.V. 1998. Acute toxicity of 6-chloronicotinic acid (a metabolite of imidacloprid) to *Chironomus tentans* under static renewal conditions. Performed by Bayer Corporation Agricultural Division, Stillwell, Kansas. Report number 108127. Submitted by Bayer Corporation Agricultural Division, Kansas City, Missouri. CDPR 161548 (DPN 51950-0316).

Relevance	Reliability
Score: 85	Score: 77.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1987 and EPA 1975, 1982, 1985	
Phylum/subphylum	Euarthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*tentans*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	12 d post egg deposition	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	24, 48 h: 100 % survival 72 h: 90 % survival 96 h: 90 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	24 h: 100 % normal 48 h: 90 % normal	

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
	72 h: 100 % normal of survivors 96 h: 100 % normal of survivors	
Temperature	21 ± 1 °C	
Test type	Static renewal	
Photoperiod/light intensity	16 l: 8 d; 682 lux	
Dilution water	Hard blended water	Filtered/sterilized spring water blended with dechlorinated municipal water
pH	8.4	
Hardness	166 mg/L $CaCO_3$	
Alkalinity	132 mg/L as $CaCO_3$	
Conductivity	367 µmhos/cm	
Dissolved Oxygen	4.8-8.8 mg/L	55-99 %
Feeding	0.1 mL Tetramin/d	
Purity of test substance	97 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	1; not reported	3 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; not reported	reps
LC_{50} (95% CI) (mg/L)	>1 mg/L	Method: Not reported
NOEC	1 mg/L	Method: Not reported p: Not reported MSD: Not reported
LOEC	>1 mg/L	
MATC (GeoMean NOEC, LOEC)	Not reported	
Effect 1: % control at NOEC	24 h: 100 % 48-96 h: 111 %	48-96 h: 100 (tmt) / 90 (mean controls) * 100 = 111 %
Effect 1: % control at LOEC	Not calculable	

	Bowers 1996	***C. tentans***
Parameter	**Value**	**Comment**
Effect 2: % control at NOEC	24 h: 100 % 48-96 h: 111 %	48-96 h: 100 (tmt) / 90 (mean controls) * 100 = 111 %
Effect 2: % control at LOEC	Not calculable	

Notes:

Solubility (S) of this metabolite is unknown. Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below imidacloprid 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Measured concentrations (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), Point estimates (8). Total: 100-22 =78

Acceptability: Measured concentrations within 20% nominal (4), Dissolved oxygen (6), Number of concentrations (3), Dilution factor (2), Statistical method (2), Hypothesis tests (3), Minimum significant difference (1), % control at NOEC (1), Point estimates(3). Total: 100- 23=77

Reliability score: mean(78,77)=77.5

Water Toxicity Data Summary

C. tentans
Imidacloprid urea metabolite
NTN 33519

Study: Dobbs, M.G., Frank, J.T. 1996. Acute toxicity of 14C-NTN 33519 to *Chironomus tentans* under static conditions. Performed by Bayer Corporation Agricultural Division, Stillwell, Kansas. Report number 107311. Submitted by Bayer Corporation Agricultural Division, Kansas City, Missouri. USEPA MRID 43946604.

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

Relevance points taken off for: Toxicity value (15). 100-15=85

	Dobbs 1996	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	FIFRA 72-2 Acute toxicity test for freshwater invertebrates	
Phylum/subphylum	Euarthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*Tentans*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	12-14 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	24-72 h: 100 % survival 96 h: 95 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	
Temperature	22 ± 0.4 ºC	

	Dobbs 1996	***C. tentans***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	16 l:8 d; 753.5 lux	
Dilution water	Hard blended water	Filtered/sterilized spring water blended with dechlorinated RO tap water
pH	7.7	
Hardness	176 mg/L as $CaCO_3$	
Alkalinity	104 mg/L as $CaCO_3$	
Conductivity	368 µmhos	
Dissolved Oxygen	5.2-8.0 mg/L	57-92 %
Feeding	Tetramin as needed	
Purity of test substance	99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	100 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	0.1; 0.10	2 reps, 10/rep
Concentration 1 Nom; Meas (mg/L)	1; 1.00	2 reps, 10/rep
Concentration 1 Nom; Meas (mg/L)	10; 10.01	2 reps, 10/rep
Concentration 1 Nom; Meas (mg/L)	100; 99.80	2 reps, 10/rep
Control Nom; Meas (mg/L)	0; <0.01	2 reps, 10/rep
LC_{50} (95% CI) (mg/L)	96 h: >99.80	
EC_{50} (95% CI) (mg/L)	96 h: >99.80	Page 8 noted as LC50
NOEC	96 h: 99.80 mg/L	
LOEC	>99.80 mg/L	
MATC	Not calculable	
Effect 1: % control at NOEC	100 % survival	
Effect 1: % control at LOEC	Not calculable	
Effect 2: % control at NOEC	24 h: 100 % normal 48-72 h: 95 % normal 96 h: 100 % normal	
Effect 2: % control at LOEC	Not calculable	

Notes:

Solubility (S) of this metabolite is unknown. Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below imidacloprid 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Significance level (2), Minimum significant difference (2). Total: 100-4 =96

Acceptability: Feeding (3), Dissolved oxygen (6), Minimum significant difference (1), % control LOEC (1), Point estimates (3). Total: 100- 14=86

Reliability score: mean(96,86)=91

Water Toxicity Data Summary

C. variegatus

Study: Ward, G.S. 1990a. NTN-33893 technical: acute toxicity to sheepshead minnow, *Cyprinodon variegatus*, under static test conditions. Toxikon Environmental Sciences, Jupiter, Florida. Report number 100354. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. CDPR 120640 (DPN 51950-049).

Relevance	Reliability
Score: 85	Score: 88.5
Rating: L	Rating: R

Relevance points taken off for: Freshwater (15). 100-15=85

	Ward 1990a	***M. bahia***
Parameter	**Value**	**Comment**
Test method cited	NTN-33893: Acute toxicity to the sheepshead minnow, *Cyprinodon variegatus*, under static conditions; satisfies 40 CFR 160	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cyprinodontiformes	
Family	Cyprinodontidae	
Genus	*Cyprinodon*	
Species	*variegatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Young adults; 29 ± 2 mm	
Source of organisms	Cultured Aquatics, Northport, NY	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	2 m
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Temperature	21.2 ± 0.3 °C	
Test type	Static	

	Ward 1990a	***M. bahia***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 l : 8 d; 442-625 lux	
Dilution water	Natural filtered seawater	Salinity: 20-22 ‰
pH	7.7-8.6	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	0 h: 7.3-8.0 mg/L 72 h: 0.36-4.8 mg/L	0 h: 96-105 % 72 h: 4-53 % when aeration initiated
Feeding	None	
Purity of test substance	96.2 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	80-98 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide (DMF), 100 µg/L	
Concentration 1 Nom; Meas (mg/L)	26; 22.4	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	43; 35.2	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	72; 58.2	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	120; 105	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	200; 195	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	0; <0.01	1 rep, 10/rep
Control 2 Nom; Meas (mg/L)	0; <0.01, DMF solvent	1 rep, 10/rep
LC_{50} (95% CI) (mg/L)	24 h: >195 48 h: 169 (105-∞) 72, 96 h: 161 (105-∞)	Method: binomial
NOEC	58.2 mg/L	Method: not reported p: not reported MSD: not reported
Effect 1: % control at NOEC	100 % survival	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Conductivity (2), Significance level (2), Minimum significant difference (2). Total: 100-10 =90

Acceptability: Hardness (2), Alkalinity (2), Dissolved oxygen (6), Adequate replication (2), Minimum significant difference (1). Total: 100-13 =87

Reliability score: mean(90,87)=88.5

Water Toxicity Data Summary

C. virginica

Study: Wheat, J.,Ward, G.S. 1991. NTN-33893 technical: acute effect on new shell growth of the eastern oyster, *Crassostrea virginica*. Toxikon Environmental Sciences, Jupiter, Florida. Report number 101978. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 4225603.

Relevance	Reliability
Score: 85	Score: 89.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15).100-15=85

	Wheat 1991	***C. virginica***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1982, 1985	
Phylum/subphylum	Mollusca	
Class	Bivalvia	
Order	Ostreoida	
Family	Ostreidae	
Genus	*Crassostrea*	
Species	*virginica*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	0.21-0.41 g	
Source of organisms	Aquacultual Research Corp., Dennis, Massachusetts	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	New shell growth	
Control response 1, mean (negative; solvent)	First test: Pooled controls: 1.64 mm Second test: 2.89 mm	
Temperature	First test: 21.3 ± 1.2 °C Second test: 23.5 ± 1.9 °C	
Test type	Flow through	
Photoperiod/light intensity	16 l: 8 d; 304-508 lux	
Dilution water	Natural unfiltered seawater	Salinity: 30-35 ‰

	Wheat 1991	***C. virginica***
Parameter	**Value**	**Comment**
pH	First test: 7.8-9.1 Second test:	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	First test: >6.1 mg/L Second test: >5.9 mg/L	First test: >86 % Second test: >82 %
Feeding	Natural seawater; no supplements given	
Purity of test substance	First test: 96.2 % Second test: 95.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	113-120 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide, 100 µL/L	
Concentration 1 Nom; Meas (mg/L)	First test: 2.6; 2.93 Second test: 121.5; 145.0	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	First test: 4.3; 5.14	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	First test: 7.2; 8.19	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	First test: 12.0; 14.2	2 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	First test: 19.4; 23.3	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	Negative and solvent pooled First test: 0; not reported Second test: 0; <1.0	2 reps, 10/rep
EC_{50} (95% CI) (mg/L)	First test: 96 h shell growth: >23.3 mg/L Second test: 96 h new shell growth: >145 mg/L	Method: not reported
NOEC	First test: 23.3 mg/L Second test: not reported	Method: ANOVA p: not reported MSD: not reported
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	

	Wheat 1991	***C. virginica***
Parameter	**Value**	**Comment**
Effect 1: % control at NOEC	New shell growth First test:127 % Second test: not calculable	First test: 2.11 (tmt) / 1.64 (mean controls) * 100 = 127 %
Effect 1: % control at LOEC	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Conductivity (2), Significance level (2), Minimum significant difference (2). Total: 100-10 =90

Acceptability: Organisms randomized (1), Hardness (2), Alkalinity (2), Random design (2), Minimum significant difference (1), Point estimates(3). Total: 100-11 =89

Reliability score: mean(90,89)=89.5

Water Toxicity Data Summary

Caenis sp.

Study: Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G. and Sibley, P.K., 2018a. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. Environmental toxicology and chemistry, 37(5), pp.1430-1445.

Relevance	Reliability
Score: 85	Score: 81.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85.

	Raby 2018a	***Caenis* sp.**
Parameter	**Value**	**Comment**
Test method cited	Ontario Ministry of the Environment and Climate Change and literature derived methods	
Phylum/subphylum	Anthropdoa/Hexapoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Caenidae	
Genus	*Caenis*	
Species	Not specified	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Nymphs	
Source of organisms	Ponds in Guelph, Ontario, Canada	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	100 % mobile	
Temperature	14.7 ± 0.13 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 500-1000 lux	

	Raby 2018a	***Caenis* sp.**
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated municipal tap water	
pH	8.2	
Hardness	122 mg/L $CaCO_3$	
Alkalinity	77.70 mg/L $CaCO_3$	
Conductivity	287 µS/cm	
Dissolved Oxygen	9.9 mg/L	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	<20 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured or corrected value based on difference between nominal and measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	≥8 concentrations, not reported	1 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative	1 reps, 10/rep
LC_x (95% CI) (µg/L)	LC_{50}: <21.8	Method: log-logistic
EC_x (95% CI) (µg/L)	EC_{50}: <21.8	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-22 =78

Acceptability: Concentrations not > 2x solubility (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100-15 =85

Reliability score: mean(78,85)=81.5

Water Toxicity Data Summary

D. magna

Study: Tišler, T., Jemec, A., Mozetič, B. and Trebše, P., 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere, 76(7), pp.907-914.

Relevance	Reliability
Score: 92.5	Score: 71.5
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Tisler 2009	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	ISO 6341, 1996	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Institut fur Wasser, Boden und Lufthygiene, des Umweltbundesamtes	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	72 h	
Data for multiple times?	Not reported	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	21 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 1800 lux	
Dilution water	Dechlorinated tap water	From cited reference
pH	7.6-7.7	
Hardness	German hardness 16º	
Alkalinity	Not reported	
Conductivity	Not reported	

	Tisler 2009	***D. magna***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Not reported	
Feeding	*D. subspicatus* daily	
Purity of test substance	Analytical grade, >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	10; not reported	2 reps, not reported/rep
Concentration 2 Nom; Meas (mg/L)	40; not reported	2 reps, not reported/rep
Concentration 3 Nom; Meas (mg/L)	70; not reported	2 reps, not reported/rep
Concentration 4 Nom; Meas (mg/L)	100; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	130; not reported	2 reps, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	2 reps, not reported/rep
EC_x (95% CI) (mg/L)	24 h: EC_{10}: 36.8 EC_{50}: 97.9 (81.4-127.7) EC_{80}: 260 48 h: EC_{10}: 22.5 EC_{50}: 56.6 (34.4-77.2) EC_{80}: 142	Method: probit

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Hypothesis tests (8), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 27=73

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Adequate organisms per rep (2), Acclimated (1), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-30 =70

Reliability score: mean(73,70)=71.5

Water Toxicity Data Summary

D. rerio

Study: Tišler, T., Jemec, A., Mozetič, B. and Trebše, P., 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere, 76(7), pp.907-914.

Relevance	Reliability
Score: 92.5	Score: 71.5
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Tisler 2009	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	ISO 7346-1, 1996	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	Danio	
Species	Rerio	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Commercial supplier	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	21 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	12 l: 12 d	
Dilution water	Unpolluted stream	
pH	8.4	
Hardness	140 mg/L $CaCO_3$	
Alkalinity	131 mg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	Measured but not reported	
Feeding	Commercial fish food; frequency not reported	

	Tisler 2009	***D. rerio***
Parameter	**Value**	**Comment**
Purity of test substance	Analytical grade, >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	200; not reported	2 reps, not reported/rep
Concentration 2 Nom; Meas (mg/L)	215; not reported	2 reps, not reported/rep
Concentration 3 Nom; Meas (mg/L)	260; not reported	2 reps, not reported/rep
Concentration 4 Nom; Meas (mg/L)	280; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	300; not reported	2 reps, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	2 reps, not reported/rep
LC_x (95% CI) (mg/L)	96 h: LC_{10}: 201 LC_{50}: 241 (224-257) LC_{80}: 290	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism size/age (5), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 22=78

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Organism size/age (3), Adequate organisms per rep (2), Feeding (3), Dissolved oxygen (6), Conductivity (1), Dilution factor (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-35 =65

Reliability score: mean(78,65)=71.5

Water Toxicity Data Summary

D. rerio

Study: Tišler, T., Jemec, A., Mozetič, B. and Trebše, P., 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere, 76(7), pp.907-914.

Relevance	Reliability
Score: 77.5	Score: 60
Rating: L	Rating: L

Relevance points taken off for: Control response (7.5), Toxicity value (15). 100-22.5=77.5

	Tisler 2009	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	ISO 15088 (2007)	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*Rerio*	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Embryo, 4-8 cell strage	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	26 º C	
Test type	Static	
Photoperiod/light intensity	12 l: 12 d	
Dilution water	Synthetic ISO medium	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	

	Tisler 2009	***D. rerio***
Parameter	**Value**	**Comment**
Purity of test substance	Analytical grade, >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	10; not reported	2 reps, not reported/rep
Concentration 2 Nom; Meas (mg/L)	40; not reported	2 reps, not reported/rep
Concentration 3 Nom; Meas (mg/L)	60; not reported	2 reps, not reported/rep
Concentration 4 Nom; Meas (mg/L)	80; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	160; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	320; not reported	2 reps, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	2 reps, not reported/rep
LC_x (95% CI) (mg/L)	Not reported	Method: not reported

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100- 32=68

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Organism size/age (3), Adequate organisms per rep (2), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100-48 =52

Reliability score: mean(68,52)=60

Water Toxicity Data Summary

D. rerio

Study: Wang, Y., Yang, G., Dai, D., Xu, Z., Cai, L., Wang, Q. and Yu, Y., 2017. Individual and mixture effects of five agricultural pesticides on zebrafish (Danio rerio) larvae. Environmental Science and Pollution Research, 24(5), pp.4528-4536.

Relevance	Reliability
Score: 92.5	Score: 62
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Wang 2017	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	OECD TG 236, 2013	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*Rerio*	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Larvae	
Source of organisms	China Zebrafish Resource Center, Wuhan City, China	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	48, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	26 º C	
Test type	Static-renewal	24 h
Photoperiod/light intensity	14 l: 10 d	
Dilution water	Standard water to ISO 7346-3	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	

	Wang 2017	***D. rerio***
Parameter	**Value**	**Comment**
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	95.3 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone and Tween-80, concentrations not reported	
Concentration 1 Nom; Meas (mg/L)	Not reported	3 reps, 20/rep
Control 1 Nom; Meas (mg/L)	Negative Solvent	3 reps, 20/rep
LC_{50} (95% CI) (mg/L)	48 h: 186.9 (134.5-325.1) 96 h: 143.7 (99.98-221.6)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Temperature (4), Photoperiod (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-33 =67

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Number of concentrations (3), Adequate replication (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-43 =57

Reliability score: mean(67,57)=62

Water Toxicity Data Summary

D. rerio

Study: Wu, S., Li, X., Liu, X., Yang, G., An, X., Wang, Q. and Wang, Y., 2018. Joint toxic effects of triazophos and imidacloprid on zebrafish (Danio rerio). Environmental Pollution, 235, pp.470-481.

Relevance	Reliability
Score: 92.5	Score: 63
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Wu 2018	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	OECD guidelines 203 (1992) and 236 (2013)	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*Rerio*	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Embryos, 2 h post-fertilization Larvae, 72 h post-hatch Juvenile, 30 d Adult, 3 m	
Source of organisms	China Zebrafish Resource Center, Wuhan, China	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	26 ± 1 ° C	

	Wu 2018	***D. rerio***
Parameter	**Value**	**Comment**
Test type	Static-renewal	1/d
Photoperiod/light intensity	14 l: 10 d	
Dilution water	Standard water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Embryo, larvae not fed; juvenile and adults fasted 1 d prior to testing	
Purity of test substance	95.3 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	GC-MS	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide and Tween-80	
Concentration 1 Nom; Meas (mg/L)	Not reported	Embyro, larvae: 3 reps, 24/rep Juvenile, adult: 3 reps, 10/rep
Control 1 Nom; Meas (mg/L)	Negative Solvent	reps
LC_{50} (95% CI) (mg/L)	Embryos: 24 h: 433.9 (238.7-584.3) 48 h: 352.1 (157.6-492.7) 72 h: 150.9 (72.4-264.8) 96 h: 121.6 (80.21-172.9) Larvae: 96 h: 128.9 (88.47-173.6) Juvenile: 96 h: 26.39 (19.04-38.01) Adult: 96 h: 76.08 (49.25-106.9)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-27 =73

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (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), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-47 =53

Reliability score: mean(73,53)=63

Water Toxicity Data Summary

D. subspicatus
Imidacloprid metabolite
6-chloronicotinic acid

Study: Malev, O., Klobučar, R.S., Fabbretti, E. and Trebše, P., 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae Desmodesmus subspicatus and amphipod Gammarus fossarum. Pesticide biochemistry and physiology, 104(3), pp.178-186.

Relevance	Reliability
Score: 85	Score: 84.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Malev 2012	***D. subspicatus***
Parameter	**Value**	**Comment**
Test method cited	ISO 8692, Water Quality – Freshwater Algal Growth Inhibition Test with Unicellular Green Algae	
Phylum/subphylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Desmodesmus*	
Species	*Subspicatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Exponential growth phase	
Source of organisms	Helmholtz Centre for Environmental Research-UFZ, Leipzig, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes, by virtue of organism size	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Growth inhibition	

	Malev 2012	***D. subspicatus***
Parameter	**Value**	**Comment**
Control response 1, mean (negative; solvent)	100 % normal	
Temperature	23 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	Continuous;1100 lux	
Dilution water	Growth media	
pH	Growth media	
Hardness	Growth media	
Alkalinity	Growth media	
Conductivity	Growth media	
Dissolved Oxygen	Growth media	
Feeding	Growth media	
Purity of test substance	97 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	99-103 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide; concentration not reported	
Concentration 1 Nom; Meas (mg/L)	4.7; 4.5	3 reps, 10^4 cells/mL/rep
Concentration 2 Nom; Meas (mg/L)	15.7; 14.8	3 reps, 10^4 cells/mL/rep
Concentration 3 Nom; Meas (mg/L)	31.5; 29.9	3 reps, 10^4 cells/mL/rep
Concentration 4 Nom; Meas (mg/L)	78.7; 77.1	3 reps, 10^4 cells/mL/rep
Concentration 5 Nom; Meas (mg/L)	157.5; 156.1	3 reps, 10^4 cells/mL/rep
Control 1 Nom; Meas (mg/L)	Solvent: 0; not reported	6 reps
IC_{50} (95% CI) (mg/L)	Not calculable due to low inhibitory effect	Method: NA

Notes: Reliability points not deducted for water quality parameters because test performed in growth media according to noted standard method.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-16 =84

Acceptability: No prior contamination (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100- 15=85

Reliability score: mean(84,85)=84.5

Water Toxicity Data Summary

D. subspicatus

Study: Malev, O., Klobučar, R.S., Fabbretti, E. and Trebše, P., 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae Desmodesmus subspicatus and amphipod Gammarus fossarum. Pesticide biochemistry and physiology, 104(3), pp.178-186.

Relevance	Reliability
Score: 85	Score: 84.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Malev 2012	***D. subspicatus***
Parameter	**Value**	**Comment**
Test method cited	ISO 8692, Water Quality – Freshwater Algal Growth Inhibition Test with Unicellular Green Algae	
Phylum/subphylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	Desmodesmus	
Species	Subspicatus	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Exponential growth phase	
Source of organisms	Helmholtz Centre for Environmental Research-UFZ, Leipzig, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes, by virtue of organism size	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Growth inhibition	
Control response 1, mean (negative; solvent)	100 % normal	
Temperature	23 ± 1 ° C	

	Malev 2012	***D. subspicatus***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	Continuous;1100 lux	
Dilution water	Growth media	
pH	Growth media	
Hardness	Growth media	
Alkalinity	Growth media	
Conductivity	Growth media	
Dissolved Oxygen	Growth media	
Feeding	Growth media	
Purity of test substance	99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	99-103 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide; concentration not reported	
Concentration 1 Nom; Meas (mg/L)	7.6; 7.5	3 reps, 10^4 cells/mL/rep
Concentration 2 Nom; Meas (mg/L)	25.6; 26.3	3 reps, 10^4 cells/mL/rep
Concentration 3 Nom; Meas (mg/L)	51.1; 51.4	3 reps, 10^4 cells/mL/rep
Concentration 4 Nom; Meas (mg/L)	127.8; 127.4	3 reps, 10^4 cells/mL/rep
Concentration 5 Nom; Meas (mg/L)	255.6; 255.1	3 reps, 10^4 cells/mL/rep
Control 1 Nom; Meas (mg/L)	Solvent: 0; not reported	6 reps
IC_{50} (95% CI) (mg/L)	Not calculable due to low inhibitory effect	Method: NA

Notes: Reliability points not deducted for water quality parameters because test performed in growth media according to noted standard method. Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable. Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-16 =84

Acceptability: No prior contamination (4), Organisms randomized (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100- 15=85

Reliability score: mean(84,85)=84.5

Water Toxicity Data Summary

D. subspicatus

Study: Tisler, T., Jemec, A., Mozetic, B. and Trebse, P., 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere, 76(7), pp.907-914.

Relevance	Reliability
Score: 92.5	Score: 62.5
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Tisler 2009	***D. subspicatus***
Parameter	**Value**	**Comment**
Test method cited	ISO 8692, 2004	
Phylum/subphylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Desmodesmus*	
Species	*subspicatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Culture Collection of Algae and Protazoa, Cumbria, United Kingdom	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Yes, by virtue of organism size	
Test vessels randomized?	Not reported	
Test duration	72 h	
Data for multiple times?	Not reported	
Effect 1:	Cell density	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Growth rate	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	21 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	Constant; 7000 lux	
Dilution water	Not reported	
pH	Not reported	

	Tisler 2009	***D. subspicatus***
Parameter	**Value**	**Comment**
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not reported	
Purity of test substance	Analytical grade, >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	100; not reported	2 reps, not reported/rep
Concentration 2 Nom; Meas (mg/L)	144; not reported	2 reps, not reported/rep
Concentration 3 Nom; Meas (mg/L)	207; not reported	2 reps, not reported/rep
Concentration 4 Nom; Meas (mg/L)	299; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	430; not reported	2 reps, not reported/rep
Concentration 6 Nom; Meas (mg/L)	25; not reported	2 reps, not reported/rep
Concentration 7 Nom; Meas (mg/L)	50; not reported	2 reps, not reported/rep
Concentration 8 Nom; Meas (mg/L)	100; not reported	2 reps, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	2 reps, not reported/rep
IC_x (95% CI) (mg/L)	$IC1_0$: 106 IC_{50}: 389 IC_{80}: 1425	Method: linear regression

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism life stage/size (5), Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 40=60

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Adequate organisms per rep (2), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-35 =65

Reliability score: mean(60,65)=62.5

Water Toxicity Data Summary

G. fossarum
Imidacloprid metabolite
6-chloronicotinic acid

Study: Malev, O., Klobučar, R.S., Fabbretti, E. and Trebše, P., 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae Desmodesmus subspicatus and amphipod Gammarus fossarum. Pesticide biochemistry and physiology, 104(3), pp.178-186.

Relevance	Reliability
Score: 85	Score: 80.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Malev 2012	***G. fossarum***
Parameter	**Value**	**Comment**
Test method cited	ISO 10706, Water quality – determination of long term toxicity of substances to Daphnia magna Straus (Cladocera, Crustacea), 2000.	
Phylum/subphylum	Arthropoda/crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	
Species	*fossarum*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adult male	
Source of organisms	Stream in Vogršcek, Slovenia	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	14 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Immobility/molting	
Control response 1, mean (negative; solvent)	100 % mobile/non-molted	
Effect 2:	Mortality	

	Malev 2012	***G. fossarum***
Parameter	**Value**	**Comment**
Control response 2, mean (negative; solvent)	100 % survival	
Temperature	14.7 ± 0.3 º C	
Test type	Static	
Photoperiod/light intensity	Darkness	
Dilution water	Stream water	
pH	7.9	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	378.3 µS/cm	
Dissolved Oxygen	9.8 mg/L	95.8 %
Feeding	Tetramin, daily	
Purity of test substance	97 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	99-103 % for those reported below	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	3.9; not reported	1 reps, 50/rep
Concentration 2 Nom; Meas (µg/L)	7.8; not reported	1 reps, 50/rep
Concentration 3 Nom; Meas (µg/L)	15.7; not reported	1 reps, 50/rep
Concentration 4 Nom; Meas (µg/L)	31.4; not reported	1 reps, 50/rep
Concentration 5 Nom; Meas (µg/L)	62.8; 93.5	1 reps, 50/rep
Concentration 6 Nom; Meas (µg/L)	94.6; 93.5	
Concentration 7 Nom; Meas (µg/L)	126.2; 127.3	
Concentration 8 Nom; Meas (µg/L)	157.7; 157.4	
Concentration 9 Nom; Meas (µg/L)	315.5; 315.7	
Control 1 Nom; Meas (µg/L)	0; not reported	
LC_{50} (95% CI) (µg/L)	Not reported	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-20 =80

Acceptability: No prior contamination (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100- 19=81

Reliability score: mean(80,81)=80.5

Water Toxicity Data Summary

G. fossarum

Study: Malev, O., Klobučar, R.S., Fabbretti, E. and Trebše, P., 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae Desmodesmus subspicatus and amphipod Gammarus fossarum. Pesticide biochemistry and physiology, 104(3), pp.178-186.

Relevance	Reliability
Score: 85	Score: 80.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Malev 2012	***G. fossarum***
Parameter	**Value**	**Comment**
Test method cited	ISO 10706, Water quality – determination of long term toxicity of substances to Daphnia magna Straus (Cladocera, Crustacea), 2000.	
Phylum/subphylum	Arthropoda/crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	
Species	*fossarum*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Adult male	
Source of organisms	Stream in Vogršcek, Slovenia	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	14 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Immobility/molting	
Control response 1, mean (negative; solvent)	100 % mobile/non-molted	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	100 % survival	
Temperature	14.7 ± 0.3 º C	

	Malev 2012	***G. fossarum***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	Darkness	
Dilution water	Stream water	
pH	7.9	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	378.3 µS/cm	
Dissolved Oxygen	9.8 mg/L	95.8 %
Feeding	Tetramin, daily	
Purity of test substance	99.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	99-103 % for those reported below	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (µg/L)	6.6; not reported	1 reps, 50/rep
Concentration 2 Nom; Meas (µg/L)	12.7; not reported	1 reps, 50/rep
Concentration 3 Nom; Meas (µg/L)	25.5; not reported	1 reps, 50/rep
Concentration 4 Nom; Meas (µg/L)	51.1; not reported	1 reps, 50/rep
Concentration 5 Nom; Meas (µg/L)	102.2; 105.5	1 reps, 50/rep
Concentration 6 Nom; Meas (µg/L)	153.3; 154.7	1 reps, 50/rep
Concentration 7 Nom; Meas (µg/L)	204.5; 203.9	1 reps, 50/rep
Concentration 8 Nom; Meas (µg/L)	255.6; 254.2	1 reps, 50/rep
Concentration 9 Nom; Meas (µg/L)	511.3; 511.7	1 reps, 50/rep
Control 1 Nom; Meas (µg/L)	0; not reported	
LC_{50} (95% CI) (µg/L)	Not reported	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:

Documentation: Hardness (2), Alkalinity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-20 =80

Acceptability: No prior contamination (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100- 19=81

Reliability score: mean(80,81)=80.5

Water Toxicity Data Summary

H. Azteca
Imidacloprid urea metabolite
NTN 33519

Study: Dobbs, M.G., Frank, J.T. 1996. Acute toxicity of ^{14}C-NTN 33519 to *Hyalella azteca* under static conditions. Performed by Bayer Corporation Agriculture Division, Stilwell, Kansas. Report number 107148. Submitted to Bayer Corporation Agriculture Division, Kansas City, Missouri. USEPA MRID 43946603.

Imidacloprid urea metabolite.

Relevance	Reliability
Score: 85	Score: 96
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Dobbs 1996	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	FIFRA Guideline 72-2 Acute toxicity test for freshwater invertebrates	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	7-21 d; 0.37 mm head length	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	24-72 h: 100 % survival 96 h: 90 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	

	Dobbs 1996	***H. azteca***
Parameter	**Value**	**Comment**
Effect 3:	Head length	
Control response 3, mean (negative; solvent)	0.37 mm	
Temperature	22 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 705.6 lux	
Dilution water	Filtered/sterilized spring water blended with RO treated dechlorinated tap water	Aged ≥ 1 w
pH	7.5-7.8	
Hardness	165 mg/L $CaCO_3$	
Alkalinity	120 mg/L $CaCO_3$	
Conductivity	425 µmhos/cm	
Dissolved Oxygen	7.0-9.6 mg/L	80-112 %
Feeding	Not reported	
Purity of test substance	99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	93-95 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	6.25; 5.81	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	12.5; 11.80	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	25;23.46	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	50; 46.80	2 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	100; 94.83	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; <0.01	2 reps, 10/rep
LC_{50} (95% CI) (mg/L)	96 h: >94.83	Method: visual inspection since no difference from controls
EC_{50} (95% CI) (mg/L)	96 h: >94.83	Method: visual inspection since no difference from controls

	Dobbs 1996	***H. azteca***
Parameter	**Value**	**Comment**
NOEC	94.83 mg/L	Method: visual inspection since no difference from controls p: NA MSD: NA
Effect 1: % control at NOEC	Cumulative mortality 96 % survival	95 (tmt) / 90 (mean controls) * 100 = 106 %
Effect 2: % control at NOEC	Abnormal behavior 100 % normal	
Effect 2: % control at LOEC	Head length Not calculable because treatment results not reported	

Notes:

Solubility (S) of this metabolite is unknown. Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below imidacloprid 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Significance level (2), Minimum significant difference (2). Total: 100-4 =96

Acceptability: Minimum significant difference (1), Point estimates(3). Total: 100-4 =96

Reliability score: mean(96,96)=96

Water Toxicity Data Summary

H. azteca

Study: Roney D.J., Bowers, L.M. 1996. Acute toxicity of ^{14}C-NTN 33893 to *Hylella Azteca* under static conditions. Performed by Bayer Corporation Agriculture Division, Stilwell, Kansas. Report number 107315. Submitted to Bayer Corporation Agriculture Division, Kansas City, Missouri. USEPA MRID 43946601.

Relevance	Reliability
Score: Abnormal behavior: 85; Mortality: 100	Score: 95
Rating: Abnormal behavior: L; Mortality: R	Rating: R

Abnormal behavior:
Relevance points taken off for: Toxicity endpoint (15). 100-15=85
Mortality:
Relevance points taken off for: none.

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	FIFRA Guideline 72-2 Acute Toxicity Test for Freshwater Invertebrates	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	14-21 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Cumulative mortality	
Control response 1, mean (negative; solvent)	96 h: 90 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
Effect 3:	Head length	
Control response 3, mean (negative; solvent)	0.39 mm	
Temperature	22 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d; 60-70 footcandles	
Dilution water	Hard blended water	Sterilized/filtered spring water blneded with dechlorinated tap water
pH	7.4-7.7	
Hardness	166 mg/L $CaCO_3$	
Alkalinity	120 mg/L $CaCO_3$	
Conductivity	425 µmhos/cm	
Dissolved Oxygen	7.8-8.2 mg/L	89-94 %
Feeding	Not fed during test	
Purity of test substance	96.9 % 80.2 % 83.3 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	102-106 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	No solvents used	
Concentration 1 Nom; Meas (mg/L)	5.3; 5.6	2 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	10.7; 11.0	2 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	21.4; 22.1	2 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	42.7; 43.8	2 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	85.4; 86.8	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; 0	2 reps, 10/rep
LC_{50} (95% CI) (mg/L)	48 h: 63.6 (53.9-75.1) 72 h: 55.8 (48.2-64.5) 96 h: 51.8 (44.0-60.9)	Method: Spearman-Karber
EC_{50} (95% CI) (mg/L)	96 h: 29.0 (24.7-34.0)	Method:

	Roney 1996	***H. azteca***
Parameter	**Value**	**Comment**
NOEC	96 h: 22.1	Based on mortality Method: ANOVA p: MSD:
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	Cumulative mortality 94 % survival	85 (tmt) / 90 (mean controls) * 100 = 94 %
Effect 2: % control at NOEC	Abnormal behavior 85 % normal	85 (tmt) / 100 (mean controls) * 100 = 85 %
Effect 3: % control at NOEC	Head length Not calculable with provided data (controls only)	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100-6 =94

Acceptability: Minimum significant difference (1). Total: 100-1 =99

Reliability score: mean(94,99)=95

Water Toxicity Data Summary

I. bicolor

Study: Camp, A.A. and Buchwalter, D.B., 2016. Can't take the heat: Temperature-enhanced toxicity in the mayfly Isonychia bicolor exposed to the neonicotinoid insecticide imidacloprid. Aquatic Toxicology, 178, pp.49-57.

Relevance	Reliability
Score: 90	Score: 70
Rating: R	Rating: L

Relevance points taken off for: Standard method (10). 100-10=90

	Camp 2016	***I. bicolor***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Isonychiidae	
Genus	*Isonychia*	
Species	*bicolor*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Larvae >3 mg	
Source of organisms	Eno River in Hillsborough, North Carolina	Nominally uncontaminated site in state park
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	100 % mobile	
Effect 2:	Mortality	
Control response 2, mean (negative; solvent)	100 % survival	
Temperature	15 ± 0.11 º C	
Test type	Static	
Photoperiod/light intensity	12 l: 12 d	

	Camp 2016	***I. bicolor***
Parameter	**Value**	**Comment**
Dilution water	ASTM artificial soft water	Made with deionized water
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	99.9 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide, 0.001 %	
Concentration 1 Nom; Meas (µg/L)	1; not reported	3 reps, 6/rep
Concentration 2 Nom; Meas (µg/L)	2; not reported	3 reps, 6/rep
Concentration 3 Nom; Meas (µg/L)	4; not reported	3 reps, 6/rep
Concentration 4 Nom; Meas (µg/L)	8; not reported	3 reps, 6/rep
Concentration 5 Nom; Meas (µg/L)	10; not reported	3 reps, 6/rep
Concentration 6 Nom; Meas (µg/L)	20; not reported	3 reps, 6/rep
Concentration 7 Nom; Meas (µg/L)	40; not reported	3 reps, 6/rep
Concentration 8 Nom; Meas (µg/L)	80; not reported	3 reps, 6/rep
Concentration 9 Nom; Meas (µg/L)	100; not reported	3 reps, 6/rep
Control 1 Nom; Meas (µg/L)	Negative: 0; not reported Solvent: 0; not reported	3 reps, 6/rep
LC_{50} (95% CI) (µg/L)	15 ºC: 18.77	Method: Trimmed Spearman Standard error noted as unacceptably high
EC_{50} (95% CI) (µg/L)	5.88 ± 1.29	Method:

	Camp 2016	***I. bicolor***
Parameter	**Value**	**Comment**
		Cumulative mortality and immobility

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-28 =72

Acceptability: Standard method (5), Measured concentrations within 20% nominal (4), No prior contamination (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-32 =68

Reliability score: mean(72,68)=70

Water Toxicity Data Summary

L. macrochirus

Study: Bowman, J., Bucksath, J. 1990a. Acute toxicity of NTN-33893 to bluegill (*Lepomis macrochirus*). Performed by Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri. Report number 100348. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42055314.

Relevance	Reliability
Score: Mortality: 85, Abnormal behavior: 85	Score: 87
Rating: Mortality: L, Abnormal behavior: L	Rating: R

Relevance points taken off for:
Mortality: Toxicity value (15). 100-15=85
Abnormal behavior: Endpoint (15). 100-15=85

	Bowman 1990a	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	Laboratory method based on EPA-660/3-75-009	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Centrarchidae	
Genus	Lepomis	
Species	macrochirus	
Family native to North America?	Yes	
Age/size at start of test/growth phase	0.46 g ± 0.09 27 mm ± 2	
Source of organisms	Osage Catfisheries; Osage Beach, Missouri	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Effect 2:	Abnormal behavior	
Control response 2, mean (negative; solvent)	100 % normal	
Temperature	22 °C	

	Bowman 1990a	***L. macrochirus***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Soft blended water	Hard well water with demineralized/reverse osmosis processed hard well water
pH	7.4	
Hardness	46 mg/L $CaCO_3$	
Alkalinity	58 mg/L	
Conductivity	120 µmhos/cm	
Dissolved Oxygen	4.1-8.3 mg/L	49-99 %, considered adequate during study
Feeding	Commercial fish food (Zeigler Bros., Inc.) 1-3/d, shrimp nauplii (Ocean Star International, Inc.)	
Purity of test substance	95 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	84-93 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	1.5 mL dimethylformamide	
Concentration 1 Nom; Meas (mg/L)	16; 14	10 reps, 1/rep
Concentration 2 Nom; Meas (mg/L)	27; 25	10 reps, 1/rep
Concentration 3 Nom; Meas (mg/L)	45; 42	10 reps, 1/rep
Concentration 4 Nom; Meas (mg/L)	75; 68	10 reps, 1/rep
Concentration 5 Nom; Meas (mg/L)	125; 105	10 reps, 1/rep
Control 1 Nom; Meas (mg/L)	0; 0	10 reps, 1/rep
Control 2 Nom; Meas (mg/L)	0; 0 Solvent: dimethylformamide	10 reps, 1/rep
LC_{50} (95% CI) (mg/L)	>105 mg/L	Method: Not applicable (inadequate mortality at highest conc. to calculate LC_{50})

	Bowman 1990a	***L. macrochirus***
Parameter	**Value**	**Comment**
NOEC	Abnormal behavior: 25 mg/L	Method: Not applicable p: not reported MSD: not reported
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	Not calculable	
Effect 1: % control at NOEC	100 % survived	10 (tmt) / 10 (mean controls) * 100 = 100 %
Effect 1: % control at LOEC	Not calculable	
Effect 2: % control at NOEC	100 % normal	10 (tmt) / 10 (mean controls) * 100 = 100 %
Effect 2: % control at LOEC	Not calculable	

Notes: 105 mg/L appeared to be near solubility limit, which is contradictory to literature S values below.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and were therefore acceptable.

Reliability points taken off for:
Documentation: Statistical method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100- 11=89

Acceptability: Dissolved oxygen (6), Temperature variation (3), Statistical method (2), Minimum significant difference (1), Point estimates (3). Total: 100-15 =85

Reliability score: mean(89,85)=870

Water Toxicity Data Summary

M. bahia

Study: Ward, G.S. 1990a. NTN-33893 technical: acute toxicity to mysid *Mysidopsis bahia*, under flow-through test conditions. Toxikon Environmental Sciences, Jupiter, Florida. Report number 100355. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42055319.

Relevance	Reliability
Score: 85	Score: 87
Rating: L	Rating: R

Relevance points taken off for: Freshwater (15). 100-15=85

	Ward 1990a	***M. bahia***
Parameter	**Value**	**Comment**
Test method cited	EPA Guideline No. 72-4	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Mysidopsis*	
Species	*bahia*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	<24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	First test: 100 % survival Second test: Negative control, 24-96 h: 100 % survival Solvent control, 24-28 h: 100 % survival; 72-96 h: 30 % mortality	> 70 % survival
Temperature	First test: 21.3 ± 1.4 °C Second test: 22.5 ± 2.2 °C	

	Ward 1990a	***M. bahia***
Parameter	**Value**	**Comment**
Test type	Flow-through	
Photoperiod/light intensity	16 l: 8 d/350-475 lux	
Dilution water	Natural filtered seawater	Salinity First test: 20-22 ‰ Second test: 21-23 ‰
pH	8.4-8.6	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	First test: 4.4-7.5 mg/L Second test: 3.7-7.4 mg/L	First test: 49-84 % Second test: 41-83 %
Feeding	Live brine shrimp, daily	
Purity of test substance	96.2 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	96-105 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide (DMF) First test: 10.26 µg/L Second test: not reported	
Concentration 1 Nom; Meas (µg/L)	First test: 32; 32.0 Second test: 8; 8.42	1 reps, 20/rep
Concentration 2 Nom; Meas (µg/L)	First test: 56; 58.4 Second test: 13; 13.3	1 reps, 20/rep
Concentration 3 Nom; Meas (µg/L)	First test: 92; 93.7 Second test: 22; 22.9	1 reps, 20/rep
Concentration 4 Nom; Meas (µg/L)	First test: 152; 146 Second test: 36; 37.2	1 reps, 20/rep
Concentration 5 Nom; Meas (µg/L)	First test: 256; 249 Second test: 60; 63.4	1 reps, 20/rep
Control 1 Nom; Meas (µg/L)	Negative control: First test: 0; <2 Second test: 0; <1	1 reps, 20/rep
Control 2 Nom; Meas (µg/L)	Solvent control: First test: 0; <2 Second test: 0; <1	1 reps, 20/rep
LC_{50} (95% CI) (µg/L)	First test: 24 h: > 249 48 h: 76.6 (63.0-90.6) 72 h: 58.3 (49.9-68.5)	Method: moving average, probit, binomial

	Ward 1990a	***M. bahia***
Parameter	**Value**	**Comment**
	96 h: 37.7 (25.7-46.4) Second test: 24 h: 38.1 (32.4-45.5) 48 h: 34.5 (30.2-39.6) 72 h: 33.7 (29.5-38.6) 96 h: 34.1 (22.9-37.2)	
NOEC	Fist test: Not reported Second test: 13.3	Method: Based on lack of mortality
LOEC	Not reported	
MATC (GeoMean NOEC, LOEC)	First test: not reported Second test: not calculable	
Effect 1: % control at NOEC	First test: not calculable Second test: Negative control: 100 % Solvent control, 24-48 h: 100 % Solvent control, 72-96 h: 143 %	Second test: Negative control: 100 % Solvent control, 72-96 h: 100 (tmt) / 70 (mean controls) * 100 = 143 %
Effect 1: % control at LOEC	Not calculable	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2). Total: 100-14 =86

Acceptability: Hardness (2), Alkalinity (2), Temperature variation (3), Conductivity (1), Hypothesis tests (3), Minimum significant difference (1). Total: 100-12 =88

Re score: mean(86,88)=87

Water Toxicity Data Summary

M. bahia

Study: Ward, G.S. 1991. NTN-33893 technical: chronic toxicity to mysid *Mysidopsis bahia* under flow-through test conditions. Toxikon Environmental Sciences, Jupiter, Florida. Report number 101347. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. CDPR 120648 (DPN 51950-056).

Relevance	Reliability
Score: 85	Score: 91.5
Rating: L	Rating: R

Relevance points taken off for: Freshwater (15). 100-15=85

	Ward 1991	***M. bahia***
Parameter	**Value**	**Comment**
Test method cited	EPA Guideline No. 72-4	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	Americamysis	
Species	bahia	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Post-larval, <24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	28 d	
Data for multiple times?	7, 14, 21, 28 d	
Effect 1:	Parental mortality	
Control response 1, mean (negative; solvent)	First test (cumulative % mortality): 7 d: 1.5 % 14 d: 11.5 % 21 d: 13.5 % 28 d: 13.5 % Second test (cumulative % mortality): 7 d: 3 % 14 d: 6.5 % 21 d: 10 %	Cumulative survival >80 %

	Ward 1991	***M. bahia***
Parameter	**Value**	**Comment**
	28 d: 18.5 %	
Effect 2:	Number offspring produced per female reproductive day	
Control response 2, mean (negative; solvent)	First test (cumulative): 28 d: 0.65 Second test (cumulative): 28 d: 0.71	
Effect 3:	Growth (length)	
Control response 3, mean (negative; solvent)	First test: 7.1 mm Second test:	
Effect 4:	Growth (dry weight)	
Control response 4, mean (negative; solvent)	First test: 0.9 mg Second test:	
Effect 5:	Offspring mortality	
Control response 5, mean (negative; solvent)	First test: 5 % Second test:	
Temperature	First test: 27.5 ±1.0 °C Second test: 27.6 ± 1.6 °C	
Test type	Flow-through	
Photoperiod/light intensity	16 l: 8 d/292-475 lux	
Dilution water	Natural filtered seawater	Salinity 17-22 ‰
pH	8.1-8.5	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	First test: >6.5 mg/L Second test: > 6.4 mg/L	First test: >93 % Second test: >91 %
Feeding	Live brine shrimp, daily	
Purity of test substance	First test: 96.2 % Second test (14C-labeled at 2.4 mCi): >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	90-105 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Dimethylformamide (DMF) First test: 40.5 µg/L Second test: 1.86 µg/L	
Concentration 1 Nom; Meas (ng/L)	First test: 625; 560 Second test (14C labeled): 38.8; 36.8	2 reps, 30/rep

	Ward 1991	***M. bahia***
Parameter	**Value**	**Comment**
Concentration 2 Nom; Meas (ng/L)	First test: 1250; 1290 Second test (14C labeled): 77.5; 78.4	2 reps, 30/rep
Concentration 3 Nom; Meas (ng/L)	First test: 2500; 2850 Second test (14C labeled): 155; 163	2 reps, 30/rep
Concentration 4 Nom; Meas (ng/L)	First test: 5000; 5080 Second test (14C labeled): 310; 326	2 reps, 30/rep
Concentration 5 Nom; Meas (ng/L)	First test: 10,000; 10,100 Second test (14C labeled): 620; 643	2 reps, 30/rep
Control 1 Nom; Meas (ng/L)	Negative control: First test: 0; <250 Second test (14C labeled): 0; <10	2 reps, 30/rep
Control 2 Nom; Meas (ng/L)	Solvent control: First test: 0; <250 Second test (14C labeled): 0; <10	2 reps, 30/rep
NOEC	Growth: First test: 2850 ng/L Second test: 163 ng/L Reproductive success: First test: 560 ng/L	Method: ANOVA p: 0.05 MSD: not reported
LOEC	Growth: First test: 5080 ng/L Second test: 326 ng/L Reproductive success: First test: 1290 ng/L	
MATC (GeoMean NOEC, LOEC)	Growth: First test: 3806 ng/L Second test: 230 ng/L Reproductive success: First test: 849 ng/L Second test: >643 ng/L	
Effect 1: % control at NOEC	Not calculable; no NOEC for parental mortality	
Effect 1: % control at LOEC	Not calculable; no NOEC for parental mortality	
Effect 2: % control at NOEC	First test: 32.3 % Second test: not calculable	First test: 0.21 (tmt) / 0.65 (mean controls) * 100 = 32.3 %

	Ward 1991	***M. bahia***
Parameter	**Value**	**Comment**
Effect 2: % control at LOEC	First test: 15.4 % Second test: not calculable	First test: 0.10 (tmt) / 0.65 (mean controls) * 100 = 15.4 %
Effect 3: % control at NOEC	First test: 96 % Second test: 96 %	First test: 6.8 (tmt) / 7.1 (mean controls) * 100 = 96 % Second test: 7.2 (tmt) / 7.5 (mean controls) * 100 = 96 %
Effect 3: % control at LOEC	Length First test: 96 % Second test: 92 %	First test: 6.8 (tmt) / 7.1 (mean controls) * 100 = 96 % Second test: 6.9 (tmt) / 7.5 (mean controls) * 100 = 92 %
Effect 4: % control at NOEC	Dry weight First test: 82 % 163 Second test: 87 %	First test: 0.74 (tmt) / 0.9 (mean controls) * 100 = 82 % Second test: 0.82 (tmt) / 0.92 (mean controls) * 100 = 87 %
Effect 4: % control at LOEC	First test: 69 % Second test: 79 %	First test: 0.62 (tmt) / 0.9 (mean controls) * 100 = 69 % Second test: 0.73 (tmt) / 0.92 (mean controls) * 100 = 79 %
Effect 5: % control at NOEC	Not calculable; no NOEC for offspring mortality	
Effect 5: % control at LOEC	Not calculable; no NOEC for offspring mortality	

Notes: Second test utilized 14C-labeled test material.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Conductivity (2), Minimum significant difference (2). Total: 100-8=92

Acceptability: Hardness (2), Alkalinity (2), Conductivity (1), Adequate replication (2), Minimum significant difference (1), % control at LOEC (1). Total: 100- 9=91

Reliability score: mean(92,91)=91.5

Water Toxicity Data Summary

M. japonicus

Study: Nosaka, T. 1990a. 96 hr-acute toxicity study of imidacloprid in kuruma prawn (*Penaeus japonica*). Performed by Nihon Tokushu Seizo K.K., Tokyo, Japan. Study number 90760. DPR 314658.

Relevance	Reliability
Score: 85	Score: 70
Rating: L	Rating: L

Relevance points taken off for: Freshwater (15). 100-15=85

	Nosaka 1990a	***M. japonicus***
Parameter	**Value**	**Comment**
Test method cited	Method title cited but origin undisclosed	
Phylum/subphylum	Arthropoda/crustacea	
Class	Malacostraca	
Order	Decapoda	
Family	Penaeidae	
Genus	*Marsupenaeus*	
Species	*japonicus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	0.374 g, 3.62 cm	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100 % survival	
Temperature	23 ± 2 º C	
Test type	Semi-static	48 h renewal
Photoperiod/light intensity	14 l: 10 d	
Dilution water	Natural seawater	35 ‰ salinity
pH	7.9	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	4.1-6.6 mg/L	48-77 %

	Nosaka 1990a	***M. japonicus***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	93.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide, concentration not reported	
Concentration 1 Nom; Meas (mg/L)	0.0391; not reported	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	0.156; not reported	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	0.625; not reported	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	2.50; not reported	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	10.0; not reported	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	Negative, solvent	1 rep, 10/rep
LC_{50} (95% CI) (mg/L)	24 h: 0.886 (CI not reported) 48 h: 0.459 (0.229-0.908) 72 h: 0.310 (0.152-0.610) 96 h: 0.225 (0.119-0.420)	Method: probit

Notes:
Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Analytical method (4), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-24 =76

Acceptability: Standard method (5), Measured concentrations within 20% nominal (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Temperature variation (3), Conductivity (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 36=64

Reliability score: mean(76,64)=70

Water Toxicity Data Summary

P. paucidens

Study: Nosaka, T. 1990b. 96 hr-acute toxicity study of imidacloprid in striped prawn (*Palaemon paucidens*). Performed by Nihon Tokushu Seizo K.K., Tokyo, Japan. Study number 90836. DPR 314659.

Relevance	Reliability
Score: 90	Score: 69
Rating: R	Rating: L

Relevance points taken off for: Standard method (10). 100-10=90

	Nosaka 1990b	***P. paucidens***
Parameter	**Value**	**Comment**
Test method cited	Method title/date cited but origin not disclosed	
Phylum/subphylum	Arthropoda/crustacea	
Class	Malacostraca	
Order	Decapoda	
Family	Palaemonidae	
Genus	*Palaemon*	
Species	*paucidens*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	0.291g, 2.74 cm	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	100% survival	
Temperature	23 ± 2 ° C	
Test type	Semi-static	48 h renewal
Photoperiod/light intensity	14 l: 10 d	
Dilution water	Natural well water	
pH	7.43-8.01	
Hardness	114 mg/L $CaCO_3$	
Alkalinity	94.0 mg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	3.0-8.6 mg/L	35-100 %

	Nosaka 1990b	***P. paucidens***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	93.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	No	
Concentration of carrier (if any) in test solutions	Dimethylsulfoxide, concentration not reported	
Concentration 1 Nom; Meas (mg/L)	0.195; not reported	1 rep, 10/rep
Concentration 2 Nom; Meas (mg/L)	0.781; not reported	1 rep, 10/rep
Concentration 3 Nom; Meas (mg/L)	3.13; not reported	1 rep, 10/rep
Concentration 4 Nom; Meas (mg/L)	12.5; not reported	1 rep, 10/rep
Concentration 5 Nom; Meas (mg/L)	50.0; not reported	1 rep, 10/rep
Control 1 Nom; Meas (mg/L)	Negative and solvent	1 rep, 10/rep
LC_{50} (95% CI) (mg/L)	24 h: 49.2 (25.9-98.6) 48 h: 26.3 (13.9-71.1) 72 h: 23.1 (11.9-63.0) 96 h: 20.2 (10.1-54.7; elsewhere in report LC_{50} stated as 3.13)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Analytical method (4), Measured concentrations (3), Conductivity (2), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 22=78

Acceptability: Standard method (5), Measured concentrations within 20% nominal (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Feeding (3), Dilution water (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), Random design (2), Adequate replication (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-40 =60

Reliability score: mean(78, 60)=69

Water Toxicity Data Summary

S. latigonium

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 100	Score: 67.5
Rating: R	Rating: L

Relevance points taken off for: none.

	Beketov 2008	***S. latigonium***
Parameter	**Value**	**Comment**
Test method cited	OECD 1997	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Simuliidae	
Genus	*Simulium*	
Species	*latigonium*	
Family native to North America?	Arthropoda/Crustacea	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Stream mesocosms on university campus	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	15 ± 2 º C	
Test type	Static	
Photoperiod/light intensity	10 l: 14 d	
Dilution water	M7 medium	
pH	7.4	
Hardness	180 mg/L $CaCO_3$	
Alkalinity	Not reported	
Conductivity	600 µS/cm	
Dissolved Oxygen	Not reported	

	Beketov 2008	***S. latigonium***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	Analytical grade	
Concentrations measured?	No	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	DMSO, <1 %	
Concentration 1 Nom; Meas (µg/L)	Number and values not reported	Reps not reported, 10/rep
Control 1 Nom; Meas (µg/L)	Solvent	Reps not reported, 10/rep
LC_{50} (95% CI) (µg/L)	3.73 (1.54–9.05)	Method: Trimmed Spearman–Karber

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-24 =76

Acceptability: Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), Number of concentrations (3), Random design (2), Adequate replication (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-41 =59

Reliability score: mean(76,59)=67.5

Water Toxicity Data Summary

R. subcapitata

Study: Dorgerloh, M. 2000. Imidacloprid – Influence on the growth of green alga, *Selenastrum capricornutum*. Performed by Bayer AG Crop Protection—Development, Leverkusen-Bayerwerk, Germany. Report number DOM 200018. USEPA MRID 49602705.

Relevance	Reliability
Score: 85	Score: 82.5
Rating: L	Rating: R

Relevance points taken off for: Toxicity value (15). 100-15=85

	Dorgerloh 2000	***R. subcapitata***
Parameter	**Value**	**Comment**
Test method cited	USPEA OCSPP Guideline 850.4500	
Phylum/subphylum	Chlorophyta	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Selenastraceae	
Genus	*Raphidocelis*	
Species	*subcapitata*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	3 d old preculture	
Source of organisms	Institute for Plant Physiology, University of Gottingen, Gottingen, Germany	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	By virtue of organism size relative to aliquot volume
Test vessels randomized?	Not reported	
Test duration	72 h	
Data for multiple times?		
Effect 1:	Cell numbers	
Control response 1, mean (negative; solvent)	24 h: 7.38 $x10^{-4}$ 48 h: 30.16 $x10^{-4}$ 72 h: 103.9 $x10^{-4}$	
Effect 2:	Area (biomass integral)	

	Dorgerloh 2000	***R. subcapitata***
Parameter	**Value**	**Comment**
Control response 2, mean (negative; solvent)	0-24 h: 77 0-48 h: 506 0-72 h: 2092	
Effect 3:	Growth rate	
Control response 3, mean (negative; solvent)	0-24 h: 2.07 0-48 h: 1.74 0-72 h: 1.57	
Effect 4:	% inhibition	
Control response 4, mean (negative; solvent)	0 % all times	
Temperature	23 ± 2 º C	
Test type	Static	
Photoperiod/light intensity	24 l: 0 d; 8000 lux	
Dilution water	Growth medium prepared with deionized water	
pH	8.00-8.84	
Feeding	Growth medium	
Purity of test substance	98.6 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	100-102 %	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?		
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	100; 99.5	6 reps, 1 $x10^{-4}$ cells /rep
Control 1 Nom; Meas (mg/L)	0; <1.0	6 reps, 1 $x10^{-4}$ cells /rep
EC_{50} (95% CI) (mg/L)	Biomass: >100 Growth rate: >100	Method: probit
NOEC	Biomass: <100 Growth rate: <100	Method: ANOVA p: 0.05 MSD: not reported
LOEC	Biomass: ≤100 Growth rate: ≤100	
MATC (GeoMean NOEC, LOEC)	Reported: <100	
Effect 1: % control at NOEC	Not calculable	
Effect 1: % control at LOEC	Not calculable	
Effect 2: % control at NOEC	Not calculable	
Effect 2: % control at LOEC	Not calculable	
Effect 3: % control at NOEC	Not calculable	
Effect 3: % control at LOEC	Not calculable	

	Dorgerloh 2000	***R. subcapitata***
Parameter	**Value**	**Comment**
Effect 4: % control at NOEC	Not calculable	
Effect 4: % control at LOEC	Not calculable	

Notes: Reliability points not deducted for water quality parameters because growth medium used. Performed as limit test with single test exposure.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Dissolved oxygen (4), Conductivity (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 10=90

Acceptability: Control response (9), Temperature variation (3), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3), Point estimates (3). Total: 100-25 =75

Reliability score: mean(90,75)=82.5

Water Toxicity Data Summary

S. latigonium

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 100	Score: 67.5
Rating: R	Rating: L

Relevance points taken off for: none.

	Beketov 2008	***S. latigonium***
Parameter	**Value**	**Comment**
Test method cited	OECD 1997	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Simuliidae	
Genus	*Simulium*	
Species	*latigonium*	
Family native to North America?	Arthropoda/Crustacea	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Stream near Pulsnitz, Germany	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	<10 %	
Temperature	15 ± 2 º C	
Test type	Static	
Photoperiod/light intensity	10 l: 14 d	
Dilution water	M7 medium	
pH	7.4	
Hardness	180 mg/L $CaCO_3$	
Alkalinity	Not reported	
Conductivity	600 µS/cm	
Dissolved Oxygen	Not reported	

	Beketov 2008	***S. latigonium***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	Analytical grade	
Concentrations measured?	No	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	DMSO, <1 %	
Concentration 1 Nom; Meas (µg/L)	Number and values not reported	Reps not reported, 10/rep
Control 1 Nom; Meas (µg/L)	Solvent	Reps not reported, 10/rep
LC_{50} (95% CI) (µg/L)	270 (170–450)	Method: Trimmed Spearman–Karber

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-24 =76

Acceptability: Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), Number of concentrations (3), Random design (2), Adequate replication (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-41 =59

Reliability score: mean(76,59)=67.5

Water Toxicity Data Summary

S. subscpicatus

Study: Heimbach F. 1989. Growth inhibition of green algae (*Scenedesmus subspicatus*) caused by NTN-33893 (technical). Bayer AG, West Germany. Report number 100098. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. CDPR 120659 (DPN 51950-066).

Relevance	Reliability
Score: 85	Score: 79
Rating: L	Rating: R

Relevance points taken off for: Toxicity value calculated or calculable (15). 100-15=85

	Heimbach 1989	***S. subscpicatus***
Parameter	**Value**	**Comment**
Test method cited	ISO Guideline ISO/TC 147/SC 5/WG 5 N 84 (Algal Growth Inhibition Test)	
Phylum/subphylum	Viridiplantae	
Class	Chlorophyceae	
Order	Sphaeropleales	
Family	Scenedesmaceae	
Genus	*Scenedesmus*	
Species	*Subspicatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	$1x10^4$ cells/mL	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	Given organism size and presence in growth medium, it is assumed that aliquots are inherently random
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Cell count	
Control response 1, mean (negative; solvent)	$5.67x10^4$ cells	
Effect 2:	Area under growth curve	

	Heimbach 1989	***S. subscpicatus***
Parameter	**Value**	**Comment**
Control response 2, mean (negative; solvent)	58	Units not reported
Temperature	23 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	Constant light; 8,000 lux	
Dilution water	Aseptically, filtered, deionized water	
pH	7.92-9.18	
Feeding	Growth medium	
Purity of test substance	92.8 %	
Concentrations measured?	No	Not required in test guidelines
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Not applicable	
Concentration of carrier (if any) in test solutions	Growth medium	
Concentration 1 Nom; Meas (mg/L)	10; Not reported	3 reps, $1x10^4$ cells/mL/rep
Control 1 Nom; Meas (mg/L)	0; Not reported	3 reps, $1x10^4$ cells/mL/rep
EC_{50} (95% CI) (mg/L)	Biomass: 72, 96 h: >10 mg Growth rate: 72, 96 h: >10 mg	Method: Not reported
NOEC	Biomass and growth rate: 10 mg/L	Method: Not reported p: Not reported MSD: Not reported
Effect 1: % control at NOEC	24 h: 83 % 48 h: 91 % 72 h: 100 % 96 h: 98 %	24 h: 5 (tmt) / 6 (mean controls) * 100 = 83 % 48 h: 20 (tmt) / 22 (mean controls) * 100 = % 72 h: 79 (tmt) / 79 (mean controls) * 100 = 100 % 96 h: 284 (tmt) / 289 (mean controls) * 100 = %

Notes: Reliability points were not taken off for water quality parameters (hardness, alkalinity, conductivity) because there is no guidance for these parameters in the test guidelines for

algal/plant studies, the growth medium used requires deionized water, and the medium is presumably appropriate for the test species because a specific culture media was used.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), Point estimates (8). Total: 100- 74=

Acceptability: Measured concentrations within 20% nominal (4), Number of concentrations (3), Random design (2), Statistical method (2), Minimum significant difference (1), % control at LOEC (1), Point estimates (3). Total: 100-16 =84

Reliability score: mean(74,84)=79

Water Toxicity Data Summary

V. fischeri

Study: Tišler, T., Jemec, A., Mozetič, B. and Trebše, P., 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere, 76(7), pp.907-914.

Relevance	Reliability
Score: 92.5	Score: 60
Rating: R	Rating: L

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Tisler 2009	***V. fischeri***
Parameter	**Value**	**Comment**
Test method cited	ISO 11348-2, 1998	
Phylum/subphylum	Proteobacteria	
Class	Gammaproteobacteria	
Order	Vibrionales	
Family	Vibrionaceae	
Genus	*Vibrio*	
Species	*fischeri*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Yes, by virtue of organism size	
Test vessels randomized?	Not reported	
Test duration	30 min	
Data for multiple times?	Not reported	
Effect 1:	% luminescence	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	15 ± 0.2 º C	
Test type	Static	
Photoperiod/light intensity	Not reported	
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Tisler 2009	***V. fischeri***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	Analytical grade, >99 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-DAD	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	0.78; not reported	2 reps, not reported/rep
Concentration 2 Nom; Meas (mg/L)	1.56; not reported	2 reps, not reported/rep
Concentration 3 Nom; Meas (mg/L)	3.13; not reported	2 reps, not reported/rep
Concentration 4 Nom; Meas (mg/L)	6.25; not reported	2 reps, not reported/rep
Concentration 5 Nom; Meas (mg/L)	12.5; not reported	2 reps, not reported/rep
Concentration 6 Nom; Meas (mg/L)	25; not reported	2 reps, not reported/rep
Concentration 7 Nom; Meas (mg/L)	50; not reported	2 reps, not reported/rep
Concentration 8 Nom; Meas (mg/L)	100; not reported	2 reps, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	2 reps, not reported/rep
IC_x (95% CI) (mg/L)	IC_{20}: 11.9 IC_{50}: 61.9 (61.9-62.0) IC_{80}: 320	Method: linear regression

Notes: Reliability points not deducted for use of growth medium.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Organism life stage/size (5), Measured concentrations (3), Exposure type (5), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-50 =50

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Organism size/age (3), No prior contamination (4), Adequate organisms per rep (2), Acclimation (1),

Photoperiod (2), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 30=70

Reliability score: mean(50,70)=60

Appendix A4 – Wildlife studies rated L

Water Toxicity Data Summary

A. platyrhynchos

Study: Toll, P.A. 1990. Technial NTN-33893: a subacute dietary LC_{50} with mallard ducks. Performed by Mobay Corporation, Agricultural Chemicals Division, Stilwell, Kansas. Report number 102238. Submitted to Mobay Corporation, Agricultural Chemicals Division, Kansas City, Missouri. USEPA MRID 42055311.

Reliability
Score: 93
Rating: R

	Toll 1990	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Test method cited	FIFRA 71-2, 1984; ASTM E857-81.	
Phylum/subphylum	Chordata	
Class	Aves	
Order	Anseriformes	
Family	Anatidae	
Genus	Anas	
Species	platyrhynchos	
Family native to North America?	Yes	
Age/size at start of test/growth phase	10 d	
Source of organisms	Whistling Wings, Hanover, Illinois	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	5 d exposure + 3 d observation	
Data for multiple times?	0, 5, 8 d	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	0	
Effect 2:	Exhibiting toxic signs	
Control response 2, mean (negative; solvent)	0	
Effect 3:	Body weight	
Control response 3, mean (negative; solvent)	0 d: 174 g 5 d: 318 g	

	Toll 1990	***A. platyrhynchos***
Parameter	**Value**	**Comment**
	8 d (3 d post exposure): 409 g	
Effect 4:	Growth	
Control response 4, mean (negative; solvent)	0-5 d: 144 g 5-8 d (post exposure): 91 g	
Effect 5:	Feed consumption	
Control response 5, mean (negative; solvent)	0-5 d: 58.9 g 5-8 d (post exposure): 70.5 g	
Effect 6:	Necropsy findings	
Control response 6, mean (negative; solvent)	4	Pooled controls; spleen/liver/kidney conditions
Temperature	70 ± >1 °C	
Test type	Dietary	
Photoperiod/light intensity	16 l: 8	
Feeding	Teklad DU-11 Duck Starter *ad libitum*	
Purity of test substance	97.4 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	88-100 %	
Toxicity values calculated based on nominal or measured concentrations?	Initial measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Acetone (100 mL); corn oil (280 g)	Corn oil = 120 g in treatment exposures
Concentration 1 Nom; Meas (mg/kg)	78; 69	1 reps, 10/rep
Concentration 2 Nom; Meas (mg/kg)	156; 150	1 reps, 10/rep
Concentration 3 Nom; Meas (mg/kg)	312.5; 270	1 reps, 10/rep
Concentration 4 Nom; Meas (mg/kg)	625; 622	1 reps, 10/rep
Concentration 5 Nom; Meas (mg/kg)	1250; 1228	1 reps, 10/rep
Concentration 6 Nom; Meas (mg/kg)	2500; 2474	1 reps, 10/rep
Concentration 7 Nom; Meas (mg/kg)	5000; 4797	1 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; 0	reps
LC_{50} (95% CI) ((mg/kg)	>4797	Method: Not reported

	Toll 1990	***A. platyrhynchos***
Parameter	**Value**	**Comment**
NOEC	69 mg/kg	Method: Not reported p: 0.05 MSD: Not reported Based on weight/feed consumption
LOEC	150 mg/kg	
MATC (GeoMean NOEC, LOEC)	101.7	
Effect 1: % control at NOEC	100 % survival	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 1: % control at LOEC	100 % survival	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 2: % control at NOEC	100 % normal	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 2: % control at LOEC	100 % normal	100 (tmt) / 100 (mean controls) * 100 = 100 %
Effect 3: % control at NOEC	0 d: 97 % 5 d: 95 % 8 d (post exposure): 96 %	0 d: 168 (tmt) / 174 (mean controls) * 100 = 97 % 5 d: 302 (tmt) / 318 (mean controls) * 100 = 95 % 8 d: 393 (tmt) / 409 (mean controls) * 100 = %
Effect 3: % control at LOEC	0 d: 97 % 5 d: 91 % 8 d (post exposure): 92 %	0 d: 168 (tmt) / 174 (mean controls) * 100 = 97% 5 d: 289 (tmt) / 318 (mean controls) * 100 = 91 % 8 d: 376 (tmt) / 409 (mean controls) * 100 = 92 %

	Toll 1990	***A. platyrhynchos***
Parameter	**Value**	**Comment**
Effect 4: % control at NOEC	Growth 0-5 d: 93 % 6-8 d: 100 %	0-5 d: 134 (tmt) / 144 (mean controls) * 100 = 93 % 6-8 d: 91 (tmt) / 91 (mean controls) * 100 = 100 %
Effect 4: % control at LOEC	0-5 d: 84 % 6-8 d: 95 %	0-5 d: 121 (tmt) / 144 (mean controls) * 100 = 84 % 6-8 d: 86 (tmt) / 91 (mean controls) * 100 = 95 %
Effect 5: % control at NOEC	Feed consumption 0-5 d: 95.6 % 6-8 d: 100.3 %	0-5 d: 56.3 (tmt) / 58.9 (mean controls) * 100 = 95.6 % 6-8 d: 70.7 (tmt) / 70.5 (mean controls) * 100 = 100.3 %
Effect 5: % control at LOEC	0-5 d: 123 % 6-8 d: 125 %	0-5 d: 48.0 (tmt) / 58.9 (mean controls) * 100 = 123 % 6-8 d: 71.0 (tmt) / 70.5 (mean controls) * 100 = 125 %
Effect 6: % control at NOEC	125 %	100 (tmt) / 80 (mean controls) * 100 = 125 %
Effect 6: % control at LOEC	125 %	100 (tmt) / 80 (mean controls) * 100 = 125%

Notes: Pooled controls

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Documentation and acceptability for terrestrial laboratory/field data: Reliability points taken off for: Minimum significant difference (2), Point estimates (8). Total: 100-7 =93

Appendix A5 – Aqueous studies rated N

Water Toxicity Data Summary

A. aegypti

Study: Ahmed, M.A.I. and Matsumura, F., 2012. Synergistic actions of formamidine insecticides on the activity of pyrethroids and neonicotinoids against Aedes aegypti (Diptera: Culicidae). Journal of medical entomology, 49(6), pp.1405-1410.

Relevance	Reliability
Score: 82.5	Score: 55.5
Rating: L	Rating: N

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Ahmed 2012	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Fourth instar larvae	
Source of organisms	Laboratory culture, Dr. Scott, University of California, Davis	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	25 º C	
Test type	Static	
Photoperiod/light intensity	14 l: 10 d	
Dilution water	Distilled	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	

	Ahmed 2012	***A. aegypti***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Not reported	
Feeding	Not reported	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone, concentration not reported	
Concentration 1 Nom; Meas (µg/L)	5 concentrations, values not reported	3 reps, 20/rep
Control 1 Nom; Meas (µg/L)	Solvent	3 reps, 20/rep
LC_{50} (95% CI) (µg/L)	24 h: 3180 (1570-6270) 24 h: 360 (280-962)	Method: Not reported

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

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), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-36 =66

Acceptability: Standard method (5), Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-55 =45

Reliability score: mean(66,45)=55.5

Water Toxicity Data Summary

A. aegypti

Study: Riaz, M.A., Poupardin, R., Reynaud, S., Strode, C., Ranson, H. and 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(1), pp.61-69.

Relevance
Score: 45
Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Chemical purity (15), Control response (15). 100-55=45

Study was not evaluated because relevance rated N.

Water Toxicity Data Summary

A. aegypti

Study: Riaz, M.A., Chandor-Proust, A., Dauphin-Villemant, C., Poupardin, R., Jones, C.M., Strode, C., Régent-Kloeckner, M., David, J.P. and Reynaud, S., 2013. Molecular mechanisms associated with increased tolerance to the neonicotinoid insecticide imidacloprid in the dengue vector Aedes aegypti. Aquatic Toxicology, 126, pp.326-337.

Relevance
Score: 45
Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Chemical purity (15), Controls (15). 100-55=45

Reliability score not calculated because relevance rated N.

	Riaz 2013	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Fourth instar larvae Adult	
Source of organisms	Laboratory culture "Bora-Bora"	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	Not reported	
Test type	Larvae: not reported Adult: topical	
Photoperiod/light intensity	Not reported	
Dilution water	Not reported	

	Riaz 2013	***A. aegypti***
Parameter	**Value**	**Comment**
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not reported	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone, concentration not reported	
Concentration 1 Nom; Meas (µg/L)	4 concentrations, values not reported	Larvae: 3 reps, 25/rep
Control 1 Nom; Meas (µg/L)	Larvae: Not reported Adult: acetone, concentration not reported	
LC_{50} (95% CI) (µg/L)	Susceptible strain: Larvae: 339 (261-465) Adult: 6830 (5577-7964) Resistant strain: Larvae: 1833 (1634-2057_ Adult: 8352 (7221-9462)	Method: probit

Notes: Bora-Bora strain is susceptible to all insecticides. Imidi-R strain was selected to be resistant to imidacloprid for several generations.

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

A. albopictus

Study: Liu, H., Cupp, E.W., Guo, A. and Liu, N., 2004a. Insecticide resistance in Alabama and Florida mosquito strains of Aedes albopictus. Journal of medical entomology, 41(5), pp.946-952.

Relevance	Reliability
Score: 82.5	Score: 49.5
Rating: L	Rating: N

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Liu 2004a	***A. albopictus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*albopictus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Fourth instar larvae	
Source of organisms	Field collected and laboratory cultures	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	25 º C	
Test type	Not reported	
Photoperiod/light intensity	Not reported	
Dilution water	Chlorinated tap water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Liu 2004a	***A. albopictus***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	97.7 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	1 % acetone	
Concentration 1 Nom; Meas (µg/L)	3-4 concentrations, values not reported	3 rep, 20/rep
Control 1 Nom; Meas (µg/L)	Acetone	3 rep, 20/rep
LC_{50} (95% CI) (µg/L)	Four *A. aegypti* strains tested, lowest value: 0.3 (0.2-0.5)	Method: probit

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-39 =61

Acceptability: Standard method (5), Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Feeding (3), Acclimation (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-62 =38

Reliability score: mean(61,38)=49.5

Water Toxicity Data Summary

A. albopictus

Study: Oppold, A., Kreß, A., Bussche, J.V., Diogo, J.B., Kuch, U., Oehlmann, J., Vandegehuchte, M.B. and Müller, R., 2015. Epigenetic alterations and decreasing insecticide sensitivity of the Asian tiger mosquito Aedes albopictus. Ecotoxicology and environmental safety, 122, pp.45-53.

Relevance	Reliability
Score: 67.5	Score: 51
Rating: N	Rating: N

Relevance points taken off for: Standard method (10), Chemical purity (15), Control response (7.5). 100-32.5=67.5

	Oppold 2015	***A. albopictus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Anthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*albopictus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	F_1 and F_2 larvae 24 h after hatching	Parental generation F_0 exposed to genistein or vinclozolin insecticides
Source of organisms	Laboratory culture from extended experiment	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?		
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	25 ± 1 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	

	Oppold 2015	***A. albopictus***
Parameter	**Value**	**Comment**
Dilution water	Mixture of deionized and tap water, 1:1	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	0.5 mg Tetramin	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (µg/L)	1.25; not reported	20 reps, 1/rep
Concentration 2 Nom; Meas (µg/L)	2.5; not reported	20 reps, 1/rep
Concentration 3 Nom; Meas (µg /L)	5; not reported	20 reps, 1/rep
Concentration 4 Nom; Meas (µg /L)	10; not reported	20 reps, 1/rep
Concentration 5 Nom; Meas (µg /L)	20; not reported	20 reps, 1/rep
Concentration 6 Nom; Meas (µg mg/L)	30; not reported	20 reps, 1/rep
Concentration 7 Nom; Meas (µg /L)	40; not reported	20 reps, 1/rep
Concentration 8 Nom; Meas (µg /L)	60; not reported	20 reps, 1/rep
Concentration 9 Nom; Meas (µg /L)	80; not reported	20 reps, 1/rep
Concentration 10 Nom; Meas (µg /L)	100; not reported	20 reps, 1/rep
LC_{50} (95% CI) (µg /L)	F_1 from solvent control/unexposed F_0: 47.9 (42.3-55.7) F2 from solvent control/unexposed F_0: 60.4 (55.7-65.6)	Method: Not reported

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Chemical purity (5), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-38 =62

Acceptability: Standard method (5), Control response (9), Chemical purity (10), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (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), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-62 =38

Reliability score: mean(62,38)=51

Water Toxicity Data Summary

A. stephensi

Study: Uragayala, S., Verma, V., Natarajan, E., Velamuri, P.S. and Kamaraju, R., 2015. Adulticidal & larvicidal efficacy of three neonicotinoids against insecticide susceptible & resistant mosquito strains. The Indian journal of medical research, 142(Suppl 1), p.S64.

Relevance	Reliability
Score: 82.5	Score: 55.5
Rating: L	Rating: N

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Uragayala 2015	***A. stephensi***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Anopheles*	
Species	*stephensi*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Larvae: late III-early IV instar	
Source of organisms	Insectary of NIMR, New Delhi, India	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	Larvae: 72 h Adult: 24 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	27 º C	
Test type	Topical	
Photoperiod/light intensity	Not reported	
Dilution water	Larvae: boiled tap water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Uragayala 2015	***A. stephensi***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	99.2 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Larvae: ethanol, concentration not reported Adult: acetone, concentration not reported	
Concentration 1 Nom; Meas	Larvae: 1-200 mg/L Adult: 0-100 ng/mg	Larvae: 4 reps, 20/rep Adult: 100 reps, 1/rep
Control 1 Nom; Meas	Solvent	Larvae: 4 reps, 20/rep Adult: 100 reps, 1/rep
LC_{50} (95% CI) (ng/mg)	Susceptible strain: 2.217 (CI not reported) Resistant strain: 0.297 (CI not reported)	Method: probit

Notes: Strain susceptible to organochlorines, organophosphates, and pyrethroids tested as well as strain that is resistant to those compounds (1 strain each).

Solubility (S) of imidacloprid = 31,181.39 ng/mg, 2S = 62,362.78 ng/mg. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-34 =66

Acceptability: Standard method (5), Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-55 =45

Reliability score: mean(66,45)=55.5

Water Toxicity Data Summary

C. mexicana

Study: Kumar, M.S., Kabra, A.N., Min, B., El-Dalatony, M.M., Xiong, J., Thajuddin, N., Lee, D.S. and Jeon, B.H., 2016. Insecticides induced biochemical changes in freshwater microalga Chlamydomonas mexicana. Environmental Science and Pollution Research, 23(2), pp.1091-1099.

Relevance	Reliability
Score: 67.5	Score: 71
Rating: N	Rating: R

Relevance points taken off for: Standard method (10), Toxicity value (15), Control response (7.5). 100-32.5=67.5

	Wheat 1991	***C. mexicana***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Chlorophyta	
Class	Chlorophyceae	
Order	Chlamydomonadales	
Family	Chlamydomonadaceae	
Genus	*Chlamydomonas*	
Species	*mexicana*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes, by virtue of organism and aliquot size	
Test vessels randomized?	Not reported	
Test duration	12 d	
Data for multiple times?	Not reported	
Effect 1:	Dry cell weight/biomass	Converted from optical density
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Biochemical parameters	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	27 º C	
Test type	Staic	

	Wheat 1991	***C. mexicana***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	14 l: 10 d; 45-50 µ mol photons/m/s	
Dilution water	Bold's basal medium	
pH	Growth medium	
Hardness	Growth medium	
Alkalinity	Growth medium	
Conductivity	Growth medium	
Dissolved Oxygen	Growth medium	
Feeding	Growth medium	
Purity of test substance	>99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	UPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	1; not reported	3 reps, 5 mL of solution/rep Solution absorbance of 1.0 at optical density of 680 nm
Concentration 2 Nom; Meas (mg/L)	5; not reported	3 reps, 5 mL of solution/rep
Concentration 3 Nom; Meas (mg/L)	10; not reported	3 reps, 5 mL of solution/rep
Concentration 4 Nom; Meas (mg/L)	20; not reported	3 reps, 5 mL of solution/rep
Concentration 5 Nom; Meas (mg/L)	25; not reported	3 reps, 5 mL of solution/rep
Control 1 Nom; Meas (mg/L)	0; not reported	3 reps, 5 mL of solution/rep
NOEC	Not reported	Method: p: MSD:
LOEC	Not reported	

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:

Documentation: Organism life stage/size (5), Measured concentrations (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-29 =71

Acceptability: Standard method (5), Control response (9), Measured concentrations within 20% nominal (4), Organism life stage/size (3), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100- 29=71

Reliability score: mean(71,71)=71

Water Toxicity Data Summary

C. quinquefaciatus

Study: Liu, H., Cupp, E.W., Micher, K.M., Guo, A. and Liu, N., 2004. Insecticide resistance and cross-resistance in Alabama and Florida strains of Culex quinquefaciatus. Journal of medical entomology, 41(3), pp.408-413.

Relevance	Reliability
Score: 82.5	Score: 49.5
Rating: L	Rating: N

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Liu 2004a	***C. quinquefaciatus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Culex*	
Species	*quinquefaciatus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Fourth instar larvae	
Source of organisms	Field collected and laboratory cultures	
Have organisms been exposed to contaminants?	Possibly since field collected	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	25 º C	
Test type	Not reported	
Photoperiod/light intensity	Not reported	
Dilution water	Chlorinated tap water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Liu 2004a	***C. quinquefaciatus***
Parameter	**Value**	**Comment**
Feeding	Not reported	
Purity of test substance	97.7 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	1 % acetone	
Concentration 1 Nom; Meas (µg/L)	3-4 concentrations, values not reported	3 rep, 20/rep
Control 1 Nom; Meas (µg/L)	Acetone	3 rep, 20/rep
LC_{50} (95% CI) (µg/L)	Four strains tested, lowest value: 0.2 (0.1-0.4)	Method: probit

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-39 =61

Acceptability: Standard method (5), Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Organisms randomized (1), Feeding (3), Acclimation (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-62 =38

Reliability score: mean(61,38)=49.5

Water Toxicity Data Summary

C. riparius

Study: Langer-Jaesrich, M., Köhler, H.R. and Gerhardt, A., 2010. Can mouth part deformities of Chironomus riparius serve as indicators for water and sediment pollution? A laboratory approach. Journal of soils and sediments, 10(3), pp.414-422.

Study automatically rated N for relevance; study not analyzed further.

Relevance	Reliability
Score: 60	Score:
Rating: N	Rating:

Relevance points taken off for: Standard method (10), Endpoint (15), Toxicity value (15). 100-40=60

Water Toxicity Data Summary

C. sapidus

Study: Osterberg, J.S., Darnell, K.M., Blickley, T.M., Romano, J.A. and Rittschof, D., 2012. Acute toxicity and sub-lethal effects of common pesticides in post-larval and juvenile blue crabs, Callinectes sapidus. Journal of Experimental Marine Biology and Ecology, 424, pp.5-14.

Relevance	Reliability
Score: 60	Score: 51.5
Rating: N	Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Controls (15). 100-40=60

	Osterberg 2012	***C. sapidus***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/crustacea	
Class	Malacostraca	
Order	Decapoda	
Family	Portunidae	
Genus	*Callinectes*	
Species	*sapidus*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Megalopae Juveniles	
Source of organisms	NOAA sampling platform, Pivers Island Bridge, Beaufort, North Carolina	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	24 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	25 º C	
Test type	Static	
Photoperiod/light intensity	Ambient	
Dilution water	Aged seawater	35 ‰ salinity
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	

	Osterberg 2012	***C. sapidus***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (mg/L)	Not reported	Megalopae: 3 reps, 5/rep Juveniles: 24 reps, 1/rep
LC_{50} (95% CI) (mg/L)	Megalopae: 10.04 (6.381-15.79) Juvenile: 1112 (841.9-1468)	Method: non-linear regression

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Control type (8), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 39=61

Acceptability: Standard method (5), Appropriate control (6), Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), No prior contamination (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Number of concentrations (3), Dilution factor (2), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-58 =42

Reliability score: mean(61,42)=51.5

Water Toxicity Data Summary

C. tentans

Study: Stoughton, S.J., Liber, K., Culp, J. and Cessna, A., 2008. Acute and chronic toxicity of imidacloprid to the aquatic invertebrates Chironomus tentans and Hyalella azteca under constant- and pulse-exposure conditions. Archives of Environmental Contamination and Toxicology, 54(4), pp.662-673.

Relevance	Reliability
Score: 82.5	Score: 86.5
Rating: L	Rating: R

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Stoughton 2008	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Euarthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	Chironomus	
Species	Tentans	
Family native to North America?	Yes	
Age/size at start of test/growth phase	7 d larvae	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Temperature	24 ± 0 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Carbon filtered tap water	
pH	8.18	
Hardness	140 µg/L $CaCO_3$	
Alkalinity	90 µg/L $CaCO_3$	
Conductivity	Not reported	
Dissolved Oxygen	7.5 µg/L	89 %

	Stoughton 2008	***C. tentans***
Parameter	**Value**	**Comment**
Feeding	Tetramin	
Purity of test substance	99.2 %	
Concentrations measured?		
Measured is what % of nominal?	78-103 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (µg/L)	1; 1.03	5 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	5; 4.39	5 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	29; 24.33	5 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	145; 115.20	5 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	725; 565.20	5 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; not reported	5 reps, 10/rep
LC_{50} (95% CI) (µg/L)	5.75 (4.10-8.08)	Method:
LC_{25} (95% CI) (µg/L)	2.46	Method:
NOEC	1.03	Method: p: MSD:
LOEC	4.39	
MATC (GeoMean NOEC, LOEC)	2.13	
Effect 1: % control at NOEC	Data not reported; not calculable	
Effect 1: % control at LOEC	Data not reported; not calculable	

Notes: Water quality parameters expressed as mean across acute/chronic tests

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Conductivity (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-94 =

Acceptability: Standard method (5), Control response (9), Organisms randomized (1), Conductivity (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-21 =79

Reliability score: mean(94,79)=86.5

Water Toxicity Data Summary

D. magna

Study: Agatz, A., Cole, T.A., Preuss, T.G., Zimmer, E. and Brown, C.D., 2013a. Feeding inhibition explains effects of imidacloprid on the growth, maturation, reproduction, and survival of Daphnia magna. Environmental science & technology, 47(6), pp.2909-2917.

Relevance
Score: 52.5
Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Toxicity value (15), Control response (7.5). 100-47.5=52.5

Reliability score not calculated because relevance score is N.

	Agatz 2013a	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Neonate, <24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	7 d	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Body size	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	Not reported	
Test type	Quasistatic	1 renewal
Photoperiod/light intensity	Not reported	

	Agatz 2013a	***D. magna***
Parameter	**Value**	**Comment**
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Algae	
Purity of test substance	99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	6.3 %; one sample 26.4 % (>10 mg/L)	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	0.40; not reported	4 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	1.20; not reported	4 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	3.70; not reported	4 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	11.1; not reported	4 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	33.3; not reported	4 reps, 10/rep
Concentration 6 Nom; Meas (mg/L)	100; not reported	4 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0; not reported	4 reps, 10/rep
LC_{50} (95% CI) (mg/L)	Not reported	Method:

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

D. magna

Study: Agatz, A., Cole, T.A., Preuss, T.G., Zimmer, E. and Brown, C.D., 2013a. Feeding inhibition explains effects of imidacloprid on the growth, maturation, reproduction, and survival of Daphnia magna. Environmental science & technology, 47(6), pp.2909-2917.

Relevance
Score: 52.5
Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Toxicity value (15), Control response (7.5). 100-47.5=52.5

Reliability score not calculated because relevance score is N.

	Agatz 2013a	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	OECD Guideline 211, 2008	Tests modified wrt feeding
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Neonate, <24 h	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	41 d	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Body size	
Control response 2, mean (negative; solvent)	Not reported	
Effect 3:	Reproduction	

	Agatz 2013a	***D. magna***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	Cumulative no. offspring/mother: 67.7 No. offspring/mother and brood: 14.4	
Effect 4:	Maturation	
Control response 4, mean (negative; solvent)	11.7 d	
Temperature	Not reported	
Test type	Pulse (1 w) followed by 4 weeks recovery	1 renewal
Photoperiod/light intensity	Not reported	
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Algae	
Purity of test substance	99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	6.3 %; one sample 26.4 % (>10 mg/L)	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	Test 1: 0.15; not reported Test 2: 0.15; not reported	10 reps, 1/rep
Concentration 2 Nom; Meas (mg/L)	Test 1: 12.0; not reported Test 2: 0.40; not reported	10 reps, 1/rep
Concentration 3 Nom; Meas (mg/L)	Test 2: 1.3; not reported	10 reps, 1/rep
Concentration 4 Nom; Meas (mg/L)	Test 2: 4.0; not reported	10 reps, 1/rep
Concentration 5 Nom; Meas (mg/L)	Test 2: 12.0; not reported	10 reps, 1/rep
Control 1 Nom; Meas (mg/L)	0; not reported	10 reps, 1/rep
LC_{50} (95% CI) (mg/L)	Not reported	
EC_{50} (95% CI) (mg/L)	Not reported	
NOEC	Not reported	
LOEC	Not reported	

Water Toxicity Data Summary

D. magna

Study: Agatz, A. and Brown, C.D., 2013b. Evidence for links between feeding inhibition, population characteristics, and sensitivity to acute toxicity for Daphnia magna. Environmental science & technology, 47(16), pp.9461-9469.

Relevance
Score: 60
Rating: N

Relevance points taken off for: Standard method (10), Endpoint (15), Toxicity value (15). 100-40=60

Reliability score not calculated because study rated N in relevance.

	Agatz 2013b	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Juvenile, 3-9 d Adults, 16-30 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	Spring treatment: 2-9 d: imidacloprid exposure 16 d: carbaryl exposure (0.02 mg/L) 17-46 d: recovery Summer treatment: 16-23 d: imidacloprid exposure 30 d: carbaryl exposure (0.02 mg/L)	

	Agatz 2013b	***D. magna***
Parameter	**Value**	**Comment**
	30-46 d: recovery	
Data for multiple times?	Not reported	
Effect 1:	Decrease in population abundance	
Control response 1, mean (negative; solvent)	Spring treatment: Neonate/juvenile: 28.8 % Primipare and adult: 12.5 % Summer treatment: Neonate/juvenile: 26.6 % Primipare and adult: -14.0 %	
Temperature	20 ± 1 º C	
Test type	Pulse	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	M4 medium	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Algae daily	
Purity of test substance	99.0 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	Imidacloprid: 0.15; not reported Carbaryl: 0.02; not reported	3 reps per treatment, not reported/rep
Concentration 2 Nom; Meas (mg/L)	Imidacloprid: 12.0; not reported Carbaryl: 0.02; not reported	3 reps per treatment, not reported/rep
Control 1 Nom; Meas (mg/L)	0; not reported	reps
LC_{50} (95% CI) (mg/L)	Not reported	
EC_{50} (95% CI) (mg/L)	Not reported	
NOEC	Not reported	
LOEC	Not reported	

Notes: Treatments varied by food availability; spring treatment had high food availability because low abundance and summer was opposite.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

D. magna

Study: Loureiro, S., Svendsen, C., Ferreira, A.L., Pinheiro, C., Ribeiro, F. and Soares, A.M., 2010. Toxicity of three binary mixtures to Daphnia magna: comparing chemical modes of action and deviations from conceptual models. Environmental Toxicology and Chemistry, 29(8), pp.1716-1726.

Relevance	Reliability
Score: 70	Score: 36.5
Rating: L	Rating: N

Relevance points taken off for: Chemical purity (15), Controls (15). 100-30=70

	Loureiro 2010	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	OECD 202	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Acute test: neonates Sublethal test: 4-5 d	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	24, 48 h	
Effect 1:	Acute test: mortality	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Sublethal test: feeding inhibition	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	± º C	
Test type	Not reported	
Photoperiod/light intensity	Not reported	
Dilution water	ASTM hard water	
pH	Not reported	

	Loureiro 2010	***D. magna***
Parameter	**Value**	**Comment**
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	*P. subcapitata* and seaweed extract of *A. nodosum* daily	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (mg/L)	Concentrations not reported, range: 60-125	5 reps, 5/rep
Control 1 Nom; Meas (mg/L)	Not reported	reps
LC_{50} (95% CI) (mg/L)	Acute test: 97 (CI not reported)	Method: logistic
EC_{50} (95% CI) (mg/L)	Sublethal test: 3.7 (CI not reported)	Method: logistic

Notes:
Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Control type (8), Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100- 56=44

Acceptability: Appropriate control (6), Control response (9), Chemical purity (10), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100- 71=29

Reliability score: mean(44,29)=36.5

Water Toxicity Data Summary

D. magna

Study: Pavlaki, M.D., Pereira, R., Loureiro, S. and Soares, A.M., 2011. Effects of binary mixtures on the life traits of Daphnia magna. Ecotoxicology and environmental safety, 74(1), pp.99-110.

Relevance
Score: 62.5
Rating: N

Relevance points taken off for: Freshwater (15), Chemical Purity (15), Control response (7.5). 100-42.5=37.5

Reliability score not calculated because relevance rated N.

	Pavlaki 2011	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	OECD 211	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	21 d	
Data for multiple times?	Not reported	
Effect 1:	Reproduction/no. neonates	
Temperature	20 ± 0 ° C	
Test type	Static-renewal	Every other day
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Not reported	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Pavlaki 2011	***D. magna***
Parameter	**Value**	**Comment**
Feeding	Algae daily	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	HPLC-UV	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (µg/L)	5 concentrations, values not reported, range: 2-10	10 reps, 1/rep
Control 1 Nom; Meas (µg/L)	Negative control	10 reps, 1/rep
LC_{50} (95% CI) (mg/L)		Method:
EC_{50} (95% CI) (µg/L)	Reproduction: 5.65 (CI not reported)	Method:

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

D. rerio

Study: Crosby, E.B., Bailey, J.M., Oliveri, A.N. and Levin, E.D., 2015. Neurobehavioral impairments caused by developmental imidacloprid exposure in zebrafish. Neurotoxicology and teratology, 49, pp.81-90.

Relevance
Score: 22.5
Rating: N

Relevance points taken off for: Standard method (10), Endpoint (15), Freshwater (15), Chemical purity (15), Toxicity value (15), Control response (7.5). 100-77.5=22.5

Study was not evaluated further because relevance score was N.

Water Toxicity Data Summary

D. rerio

Study: Scheil, V. and Köhler, H.R., 2009. Influence of nickel chloride, chlorpyrifos, and imidacloprid in combination with different temperatures on the embryogenesis of the zebrafish Danio rerio. Archives of environmental contamination and toxicology, 56(2), pp.238-243.

Relevance	Reliability
Score: 52.5	Score:
Rating: N	Rating:

Relevance points taken off for: Standard method (10), Chemical purity (15), Toxicity value (15), Control response (7.5). 100-47.5=52.5

Reliability score not calculated because relevance rated N.

	Scheil 2009	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*Rerio*	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Embryo	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	26 º C: 96 h 28 º C: 96 h 30 º C: 72 h 33.5 º C: 72 h	
Data for multiple times?	Not reported	
Effect 1:	Abnormal embryonic development	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	Four tests: 26 ± 1 º C 28 ± 1 º C 30 ± 1 º C	

	Scheil 2009	***D. rerio***
Parameter	**Value**	**Comment**
	33.5 ± 1 º C	
Test type	Static-renewal	26, 28 º C: 48 h 30, 33.5 º C: 36 h
Photoperiod/light intensity	12 l:12 d	
Dilution water	Aqua bidest (double distilled) prepared to ISO-Standard 7346/3	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Dry flake food and frozen *Tubifex* or midge larvae 2/d	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	26 º C: 1; not reported 28 º C: 5; not reported 30 º C: 5; not reported 33.5 º C: 5; not reported	4 reps, 10/rep
Concentration 2 Nom; Meas (mg/L)	26 º C: 5; not reported 28 º C: 10; not reported 30 º C: 10; not reported 33.5 º C:10; not reported	4 reps, 10/rep
Concentration 3 Nom; Meas (mg/L)	26 º C: 10; not reported 28 º C: 30; not reported 30 º C: 25; not reported 33.5 º C:25; not reported	4 reps, 10/rep
Concentration 4 Nom; Meas (mg/L)	26 º C: 15; not reported	4 reps, 10/rep
Concentration 5 Nom; Meas (mg/L)	26 º C: 20; not reported	4 reps, 10/rep
Concentration 6 Nom; Meas (mg/L)	26 º C: 30; not reported	4 reps, 10/rep
Concentration 7 Nom; Meas (mg/L)	26 º C: 40; not reported	4 reps, 10/rep
Concentration 8 Nom; Meas (mg/L)	26 º C: 50	4 reps, 10/rep
Control 1 Nom; Meas (mg/L)	0	4 reps, 10/rep

	Scheil 2009	***D. rerio***
Parameter	**Value**	**Comment**
LC_{50} (95% CI) (mg/L)	Not reported	Method:
EC_{50} (95% CI) (mg/L)	Not reported	Method:

Notes: Study showed no significant effect of imidacloprid exposure at any temperature on embryonic development.

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

D. rerio

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 92.5	Score: 47.5
Rating: R	Rating: N

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Wang 2017	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	OECD TG 236	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*Rerio*	
Family native to North America?	Introduced	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Not reported	
Have organisms been exposed to contaminants?	Not reported	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	48, 96 h	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	Not reported	
Test type	Static-renewal	24 h
Photoperiod/light intensity	Not reported	
Dilution water	Standard water	According to ISO 7346-3
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	

	Wang 2017	***D. rerio***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	95.3 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone and Tween 80, concentrations not reported	
Concentration 1 Nom; Meas (mg/L)	6 concentrations, values not reported, prepared as a twofold increase in a geometric ratio of each pesticide	3 reps, 1/rep
Control 1 Nom; Meas (mg/L)	Acetone/Tween 80 solvent control	3 reps
LC_{50} (95% CI) (mg/L)	48 h: 186.9 (134.5-325.1) 96 h: 143.7 (99.98-221.6)	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Organism source (5), Organism life stage/size (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 significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-48 =52

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), No prior contamination (4), Acclimation (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-57 =43

Reliability score: mean(52,43)=47.5

Water Toxicity Data Summary

G. pulex

Study: Ashauer, R., Hintermeister, A., Potthoff, E. and Escher, B.I., 2011. Acute toxicity of organic chemicals to Gammarus pulex correlates with sensitivity of Daphnia magna across most modes of action. Aquatic toxicology, 103(1-2), pp.38-45.

Relevance
Score: 60
Rating: N

Relevance points taken off for: Standard method (10), Chemical purity (15), Controls (15). 100-40=60

Reliability score not calculated because relevance scored N.

	Ashauer 2011	***G. pulex***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	Gammarus	
Species	pulex	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Headwater stream in Itziker Reid, Zurich, Switzerland	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	24, 48, 72, 96 h	
Effect 1:	Immobility	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	Not reported	
Test type	Not reported	
Photoperiod/light intensity	Not reported	
Dilution water	Artificial pond water	

	Ashauer 2011	***G. pulex***
Parameter	**Value**	**Comment**
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Horse chestnut leaf discs *ad libitum*	
Purity of test substance	%	
Concentrations measured?	Yes	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone, concentration not reported	
Concentration 1 Nom; Meas (mg/L)	7 concentrations, values not reported	2 reps, 10/rep
Control 1 Nom; Meas (mg/L)	Not reported	reps
LC_{50} (95% CI) (mg/L)	24 h: 404 (303-538) 48 h: 430 (279-664) 72 h: 405 (225-729) 96 h: 514 (298-888)	Method: log-logistic

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

G. pulex

Study: Nyman, A.M., Hintermeister, A., Schirmer, K. and Ashauer, R., 2013. The insecticide imidacloprid causes mortality of the freshwater amphipod Gammarus pulex by interfering with feeding behavior. PloS one, 8(5), p.e62472.

Relevance
Score: 67.5
Rating: N

Relevance points taken off for: Standard method (10), Toxicity value (15), Control response (7.5). 100-32.5=67.5

Reliability score not calculated because relevance rated N.

	Nyman 2013	***G. pulex***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda/Crustacea	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	*Gammarus*	
Species	*pulex*	
Family native to North America?	Arthropoda/Crustacea	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Headwater stream in Itziker Ried, Switzerland	
Have organisms been exposed to contaminants?	Possibly because field collected	
Animals acclimated and disease-free?	5-7 d	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	14 d 21 d	
Data for multiple times?	14, 21 d	
Effect 1:	Mobility	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Food consumption	
Control response 2, mean (negative; solvent)	14 d: 0.929 leaf discs 21 d: 103.9 leaf discs	
Effect 3:	Mortality	

	Nyman 2013	***G. pulex***
Parameter	**Value**	**Comment**
Control response 3, mean (negative; solvent)	Not reported	
Temperature	13 º C	
Test type	14 d exposures: Treatment A: two 1 d pulses with 4 days recovery interludes Treatment B: two 1 day pulses with 8 days recovery interludes Treatment C: static-renewal 21 d exposures: Same as above but A=4 d and B=11 d recoveries	Solution renewed at least every 5 d; total exposure of all treatments equal over test duration
Photoperiod/light intensity	12 l: 12d	
Dilution water	Artificial pond water made with nanopure water	
pH	14 day exposure: 6.78-7.24 21 day exposure: 6.93-7.82	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	14 day exposure: 585-620 µmhos/cm 21 day exposure: 583-624 µmhos/cm	
Dissolved Oxygen	14 day exposure: 1.39-4.32 mg/L 21 day exposure: 2.64-7.92 mg/L	14 day exposure: 13-41 % 21 day exposure: 25-75 %
Feeding	Horse chestnut leaves	
Purity of test substance	^{14}C-labeled: 96.97 % Unlabeled: 99.9%	
Concentrations measured?	Radioactivity measured so no differentiation between parent and degradates	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Radioactivity	

	Nyman 2013	***G. pulex***
Parameter	**Value**	**Comment**
Concentration of carrier (if any) in test solutions	10 mL Ecoscint A scintillation cocktail to measure radioactivity	
Concentration 1 Nom; Meas (µmol/L)	14 d exposure, day 0: Treatment A (pulse): 0.35 (90 µg/L); 0.3595	7 reps, 10/rep
Concentration 2 Nom; Meas (µmol/L)	14 d exposure, day 0: Treatment B (pulse): 0.35 (90 µg/L); 0.3594	7 reps, 10/rep
Concentration 3 Nom; Meas (µmol/L)	14 d exposure, day 0: Treatment C (static-renewal): 0.06 (15 µg/L); 0.0638	7 reps, 10/rep
Concentration 4 Nom; Meas (µmol/L)	21 d exposure, day 0: Treatment A (pulse): 0.59 (140 µg/L); 0.5517	7 reps, 10/rep
Concentration 5 Nom; Meas (µmol/L)	21 d exposure, day 0: Treatment B (pulse): 0.59 (140 µg/L); 0.5605	7 reps, 10/rep
Concentration 6 Nom; Meas (µmol/L)	21 d exposure, day 0: Treatment C (static-renewal): 0.06 (15 µg/L); 0.0480	7 reps, 10/rep
Control 1 Nom; Meas (µmol/L)	Negative Solvent	7 reps, 10/rep
LC_{50} (95% CI) (µmol/L)	Not reported	Method:
EC_{50} (95% CI) (µmol/L)	Not reported	Method:

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Water Toxicity Data Summary

H. Azteca

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 92.5	Score: 54.5
Rating: R	Rating: N

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Lanteigne 2015	***H. Azteca***
Parameter	**Value**	**Comment**
Test method cited	EPA 2000	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	8-10 d	
Source of organisms	Aquatic Toxicology Laboratory at Southern Illinois University	
Have organisms been exposed to contaminants?	Not	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	23 ± 2 º C	
Test type	Not reported	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Moderately hard reconstituted water	

	Lanteigne 2015	***H. Azteca***
Parameter	**Value**	**Comment**
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone	
Concentration 1 Nom; Meas (µg/L)	10.66; not reported	3 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	21.32; not reported	3 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	42.63; not reported	3 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	85.27; not reported	3 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	170.53; not reported	3 reps, 10/rep
Concentration 6 Nom; Meas (µg/L)	341.07; not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative Solvent	3 reps, 10/rep
EC_{50} (95% CI) (µg/L)	33.5 (23.3-47.4)	Method: not reported

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-38 =62

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2),

Random design (2), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-47 =53

Reliability score: mean(62,47)=54.5

Water Toxicity Data Summary

H. azteca

Study: Stoughton, S.J., Liber, K., Culp, J. and Cessna, A., 2008. Acute and chronic toxicity of imidacloprid to the aquatic invertebrates Chironomus tentans and Hyalella azteca under constant- and pulse-exposure conditions. Archives of Environmental Contamination and Toxicology, 54(4), pp.662-673.

Relevance	Reliability
Score: 82.5	Score: 86.5
Rating: L	Rating: R

Relevance points taken off for: Standard method (10), Control response (7.5). 100-17.5=82.5

	Stoughton 2008	***C. tentans***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Arthropoda	
Class	Crustacea	
Order	Malacostraca	
Family	Hyalellidae	
Genus	Hyalella	
Species	azteca	
Family native to North America?	Yes	
Age/size at start of test/growth phase	2-9 d juvenile	
Source of organisms	Laboratory culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	No	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Temperature	23.9 ± 0 º C	
Test type	Static	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Carbon filtered tap water	
pH	8.24	
Hardness	133 µg/L $CaCO_3$	
Alkalinity	87 µg/L $CaCO_3$	
Conductivity	Not reported	

	Stoughton 2008	***C. tentans***
Parameter	**Value**	**Comment**
Dissolved Oxygen	7.5 µg/L	89 %
Feeding	Tetramin	
Purity of test substance	99.2 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	64-99 %	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	LC-MS/MS	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom; Meas (µg/L)	2; 1.27	5 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	11; 8.03	5 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	55; 54.24	5 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	275; 243.68	5 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	1375; 1230.37	5 reps, 10/rep
Control 1 Nom; Meas (µg/L)	0; not reported	5 reps, 10/rep
LC_{50} (95% CI) (µg/L)	65.43 (39.78-107.62)	Method: Trimmed Spearman-Karber
LC_{25} (95% CI) (µg/L)	15.73	Method:
NOEC	54.24	Method: p: MSD:
LOEC	243.68	
MATC (GeoMean NOEC, LOEC)	114.97	
Effect 1: % control at NOEC	Data not reported; not calculable	
Effect 1: % control at LOEC	Data not reported; not calculable	

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Conductivity (2), Minimum significant difference (2), % control at NOEC/LOEC (2). Total: 100-94 =

Acceptability: Standard method (5), Control response (9), Organisms randomized (1), Conductivity (1), Random design (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1). Total: 100-21 =79

Reliability score: mean(94,79)=86.5

Water Toxicity Data Summary

M. cornuarietis

Study: Sawasdee, B. and Köhler, H.R., 2009. Embryo toxicity of pesticides and heavy metals to the ramshorn snail, Marisa cornuarietis (Prosobranchia). Chemosphere, 75(11), pp.1539-1547.

Relevance
Score: 67.5
Rating: N

Relevance points taken off for: Standard method (10), Chemical purity (15), Control response (7.5). 100-32.5=67.5

Study was not fully evaluated/summarized because relevance rated N.

Water Toxicity Data Summary

P. promelas

Study: Beketov, M.A. and Liess, M., 2008. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. Archives of environmental contamination and toxicology, 55(2), pp.247-253.

Relevance	Reliability
Score: 92.5	Score: 52
Rating: R	Rating: N

Relevance points taken off for: Control response (7.5). 100-7.5=92.5

	Lanteigne 2015	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	OECD 1992	
Phylum/subphylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	24 h, 2 cm	
Source of organisms	Aquatic Toxicology Laboratory at Southern Illinois University	
Have organisms been exposed to contaminants?	Not	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	96 h	
Data for multiple times?	Not reported	
Effect 1:	Mortality	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Immobility	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	25 ± 2 º C	
Test type	Not reported	
Photoperiod/light intensity	16 l: 8 d	
Dilution water	Moderately hard reconstituted water	

	Lanteigne 2015	***P. promelas***
Parameter	**Value**	**Comment**
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not fed	
Purity of test substance	99.5 %	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Acetone	
Concentration 1 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Concentration 2 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Concentration 3 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Concentration 4 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Concentration 5 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Concentration 6 Nom; Meas (µg/L)	Not reported	3 reps, 10/rep
Control 1 Nom; Meas (µg/L)	Negative Solvent	3 reps, 10/rep
EC_{50} (95% CI) (µg/L)	>1000	Method: not reported

Notes:

Solubility (S) of imidacloprid = 31,181.39 µg/L, 2S = 62,362.78 µg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Exposure type (5), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistics method (5), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-46 =54

Acceptability: Control response (9), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature variation (3), Conductivity (1), pH (2),

Random design (2), Statistical method (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates (3). Total: 100-50 =50

Reliability score: mean(54,50)=52

Water Toxicity Data Summary

P. pugio

Study: Key, P., Chung, K., Siewicki, T. and Fulton, M., 2007. Toxicity of three pesticides individually and in mixture to larval grass shrimp (Palaemonetes pugio). Ecotoxicology and Environmental Safety, 68(2), pp.272-277.

Relevance
Score: 67.5
Rating: N

Relevance points taken off for: Standard method (10), Freshwater (15), Control response (7.5). 100-22.5=67.5

Study not evaluated/summarized because relevance rated N.

Water Toxicity Data Summary

R. pipiens

Study: Julian, S. and J. Howard. 1999. Effects of three insecticides (carbaryl, chlorpyrifos, and imidacloprid) on hatching and development of four amphibian species, Rana pipiens, Pseudacris triseriata, Ambyst oma jeffersonianum, and Bufo americanus. Thesis for MSci. Frostburg University. http://archive.lib.msu.edu/tic/thesdiss/julian-s2000a.pdf. CDPR 170763 (DPN 51950-0339).

Relevance	Reliability
Score: 15	Score: 39
Rating: N	Rating: N

Relevance points taken off for: Standard method (10), Chemical purity (15), Toxicity value (15), Controls (15). 100-55=45

	Julian 1999	***R. pipiens***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Ranidae	
Genus	*Rana*	
Species	*Pipiens*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Late cleavage	Lab-fertilized eggs
Source of organisms	Carolina Biological Supply	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Not reported	
Animals randomized?	Yes	
Test vessels randomized?	Not reported	
Test duration	48 h	
Data for multiple times?	Not reported	
Effect 1:	Hatching success	% eggs hatched
Control response 1, mean (negative; solvent)	69.82 %	
Effect 2:	Hatchling deformities	
Control response 2, mean (negative; solvent)	Graphical data; see citation figure 4	
Temperature	16 ± 1 °C	
Test type	Static	
Photoperiod/light intensity	12 l: 12 d	

	Julian 1999	***R. pipiens***
Parameter	**Value**	**Comment**
Dilution water	Dechlorinated tap water	
pH	Not reported	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not reported	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not reported	
Concentration 1 Nom; Meas (µg/L)	"High": 88,000-110,000	3 reps, 70-100 eggs/rep
Concentration 2 Nom; Meas (µg/L)	"Medium": 17,500-20,000	3 reps, 70-100 eggs/rep
Concentration 3 Nom; Meas (µg/L)	"Low": 1,750-2,000	3 reps, 70-100 eggs/rep
Control 1 Nom; Meas (mg/L)	0; not reported	3 reps, 70-100 eggs/rep
LC_{50} (95% CI) (mg/L)	Not reported	Method: probit

Notes:

Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Reliability points taken off for:
Documentation: Method (6), Control type (8), Chemical purity (5), Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical significance (2), Significance level (2), Minimum significant difference (2), % control at NOEC/LOEC (2), Point estimates (8). Total: 100-58 =42

Acceptability: Standard method (5), Appropriate control (6), Control response (9), Chemical purity (10), Measured concentrations within 20% nominal (4), Concentrations not > 2x solubility (4), Carrier solvent (4), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Minimum significant difference (1), % control at NOEC (1), % control at LOEC (1), Point estimates(3). Total: 100-64 =36

Reliability score: mean(42,36)=39

Water Toxicity Data Summary

T. tubifex

Study: Gerhardt, A., 2009. Screening the toxicity of Ni, Cd, Cu, ivermectin, and imidacloprid in a short-term automated behavioral toxicity test with Tubifex tubifex (Müller 1774)(Oligochaeta). Human and Ecological Risk Assessment, 15(1), pp.27-40.

Relevance
Score: 67.5
Rating: N

Relevance points taken off for: Standard method (10), Chemical purity (15), Control response (7.5). 100-32.5=67.5

Reliability score not calculated because relevance rated N.

	Gerhardt 2009	***T. tubifex***
Parameter	**Value**	**Comment**
Test method cited	Not reported	
Phylum/subphylum	Annelida	
Class	Clitellata	
Order	Oligochaeta	
Family	Naididae	
Genus	*Tubifex*	
Species	*tubifex*	
Family native to North America?	Yes	
Age/size at start of test/growth phase	Not reported	
Source of organisms	Commercial supplier	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Not reported	
Test vessels randomized?	Not reported	
Test duration	24 h	
Data for multiple times?	6, 12, 18, 24 h	
Effect 1:	Locomotion	
Control response 1, mean (negative; solvent)	Not reported	
Effect 2:	Survival	
Control response 2, mean (negative; solvent)	Not reported	
Temperature	20 º C	
Test type	Static	

	Gerhardt 2009	***T. tubifex***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	12 l: 12 d	
Dilution water	Artificial water	
pH	7	
Hardness	Not reported	
Alkalinity	Not reported	
Conductivity	Not reported	
Dissolved Oxygen	Not reported	
Feeding	Not reported	
Purity of test substance	Not reported	
Concentrations measured?	Not reported	
Measured is what % of nominal?	Not reported	
Toxicity values calculated based on nominal or measured concentrations?	Not reported	
Chemical method documented?	Not reported	
Concentration of carrier (if any) in test solutions	Not used	
Concentration 1 Nom; Meas (mg/L)	0.0025; not reported	3 reps, 25/rep
Concentration 2 Nom; Meas (mg/L)	0.005; not reported	3 reps, 25/rep
Concentration 3 Nom; Meas (mg/L)	0.0075; not reported	3 reps, 25/rep
Concentration 4 Nom; Meas (mg/L)	0.01; not reported	3 reps, 25/rep
Concentration 5 Nom; Meas (mg/L)	0.05; not reported	3 reps, 25/rep
Concentration 6 Nom; Meas (mg/L)	1; not reported	3 reps, 25/rep
Concentration 7 Nom; Meas (mg/L)	10; not reported	3 reps, 25/rep
Control 1 Nom; Meas (mg/L)	0; not reported	3 reps, 25/rep
LC_{50} (95% CI) (mg/L)	24 h: 0.32 (0.23-0.48)	Method: probit
EC_{50} (95% CI) (mg/L)	6 h: 0.14 (0.13-0.14) 12 h: 0.11 (0.10-0.12) 18 h: 0.09 (0.08-0.10) 24 h: 0.09 (0.08-0.10)	Method: probit

Notes: Solubility (S) of imidacloprid = 536 mg/L, 2S = 1,072 mg/L. All exposure concentrations were below 2S and where therefore acceptable.

Imidacloprid

Study: Böttger, R., Feibicke, M., Schaller, J. and Dudel, G., 2013. Effects of low-dosed imidacloprid pulses on the functional role of the caged amphipod Gammarus roeseli in stream mesocosms. Ecotoxicology and environmental safety, 93, pp.93-100.
Study notes: Floating cages of preconditioned (microbes) alder leaves or straw stocked with 10 gammarids (treatments) or without gammarids (controls) hanging in flowing artificial stream microcosm. No effect on population levels and litter decomposition detected. Number of brood-carrying females reduced in treatments compared to controls in last 3 weeks.
Microcosm Bottger 2013.
Table 3.6 Rating of relevance/usability of data for derivation of criteria.

Parameter	**Score**	**Points**
Acceptable standard (or equivalent) method used	10	**0**
Endpoint linked to survival/growth/reproduction	15	**15**
Freshwater	15	**0**
Chemical ≥ 80% pure	15	**0**
Species is in a family that resides in North America	15	**15**
Toxicity value calculated or calculable (e.g., LC_{50})	15	**0**
Controls	15	**15**
Described (i.e., solvent, dilution water, etc.)	7.5	
Response reported and meets acceptability requirements	7.5	
Total	100	**45**

Table 13 Documentation and acceptability (reliability) evaluation for data derived from aquatic outdoor field and indoor model ecosystems experiments. Include notes next to each parameter. Adapted from ECOTOX 2006; Table from TenBrook et al. 2010.

Parameter[a]	Score[b]	**Points**
Results published or in signed, dated format **Peer review journal**	5	**5**
Exposure duration and sample regime adequately described **70 d**	6	**6**
Unimpacted site (Score 7 for artificial systems) **Artificial system**	7	**7**
Adequate range of organisms in system (1º producers, 1º, 2º consumers) **Litter leaves preconditioned in water to colonize with microbes. Adult *Gammarus roeseli* in treatment cages.**	6	**6**
Chemical		
Grade or purity stated **Not reported**	6	**0**
Concentrations measured/estimated and reported **Nominal: 12 µg/L nominal (11.9 meas) plus control**	8	**8**
Analysis method stated **GC-MS**	2	**2**

Parameter[a]	Score[b]	**Points**
Habitat described (e.g., pond, lake, ditch, artificial, lentic, lotic) **Indoor stream**	6	**6**
Water quality		
Source identified **Not reported**	2	**2**
Hardness reported **Not reported**	1	**0**
Alkalinity reported **Not reported**	1	**0**
Dissolved oxygen reported **8.8 mg/L**	2	**2**
Temperature reported 16 ± 2 **ºC (see figure 1)**	2	**2**
Conductivity reported **472 µS/cm**	1	**1**
pH reported **7.9**	1	**1**
Photoperiod reported **Not reported**	1	**0**
Organic carbon reported **2.3 mg/L**	2	**2**
Chemical fate reported **Not reported**	3	**0**
Geographic location identified (Score 2 for indoor systems) **Indoor**	2	**2**
Pesticide application		
Type reported (e.g., spray, dilutor, injection) **Pulses**	2	**2**
Frequency reported **Three pulses 1 week apart; overnight pulses to avoid photodegradation, 12 µg/L**	2	**2**
Date/season reported (Score 2 for indoor systems) **April-June**	2	**2**
Test endpoints		
Species abundance reported **Figure 1**	3	**3**
Species diversity reported **Not applicable, single species; age diversity discussed**	3	**3**
Biomass reported **Figure 3**	2	**2**
Ecosystem recovery reported **Not applicable**	2	**2**
Statistics		
Methods identified **Mann-Whitney for differences from control**	2	**2**
At least 2 replicates **4 control, 4 treatment**	3	**3**
At least 2 test concentrations and 1 control **1 plus control**	3	**0**
Dose-response relationship observed **No**	2	**0**
Hypothesis tests		
NOEC determined **Not applicable**	4	**4**

Parameter[a]	Score[b]	**Points**
Significance level stated **Not reported**	2	**0**
Minimum significant difference reported **Not reported**	2	**0**
% of control at NOEC and/or LOEC reported or calculable **Not reported**	2	**0**
Total **Reliability**	100	**77**

LOEC = lowest observed effect concentration, NOEC = no observed effect concentration.
[a]Compiled from RIVM 2001, USEPA 1985 and 2003a, ECOTOX 2006, CCME 1995, ANZECC and ARMCANZ 2000, OECD 1995a, and van der Hoeven et al. 1997.
[b]Weighting based on ECOTOX 2006 and on data quality criteria in RIVM 2001 and OECD 1995a.

Imidacloprid

Study: Colombo, V., Mohr, S., Berghahn, R. and Pettigrove, V.J., 2013. Structural changes in a macrozoobenthos assemblage after imidacloprid pulses in aquatic field-based microcosms. Archives of environmental contamination and toxicology, 65(4), pp.683-692.
Study notes: 56 randomized, floating outdoor microcosms with uncontaminated sediment and filtered pond water. Imidacloprid rapid decline via aqueous photolysis. Decreased abundance/emergence of Ephemeroptera, and survival of chironomid subfamilies Tanypodinae and Orthocladiinae at 2.3 µg/L. Gastropod Radix sp. abundance increased at high imidacloprid concentrations, probably due to decreased competition for food with sensitive species.

Microcosm Colombo 2013.

Table 3.6 Rating of relevance/usability of data for derivation of criteria.

Parameter	**Score**	**Points**
Acceptable standard (or equivalent) method used	10	**0**
Endpoint linked to survival/growth/reproduction	15	**15**
Freshwater	15	**15**
Chemical $\geq$ 80% pure	15	**0**
Species is in a family that resides in North America	15	**15**
Toxicity value calculated or calculable (e.g., LC_{50})	15	**0**
Controls	15	
Described (i.e., solvent, dilution water, etc.)	7.5	**7.5**
Response reported and meets acceptability requirements	7.5	**0**
Total	100	**52.5**

Documentation and acceptability (reliability) evaluation for data derived from aquatic outdoor field and indoor model ecosystems experiments. Include notes next to each parameter. Adapted from ECOTOX 2006; Table from TenBrook et al. 2010.

Parameter[a]	Score[b]	**Points**
Results published or in signed, dated format **Peer review journal**	5	**5**
Exposure duration and sample regime adequately described **21 d**	6	**6**
Unimpacted site (Score 7 for artificial systems) **Unpolluted site closed to public**	7	**7**
Adequate range of organisms in system (1º producers, 1º, 2º consumers) **Natural colonization; macroinvertebrates: Chironomidae (Diptera) (65%), Gastropoda (18 %), insect families were Ephemeroptera (Caenis sp. and Cloeon sp.)**	6	**6**
Chemical		
Grade or purity stated **Not reported**	6	**0**
Concentrations measured/estimated and reported **Nominal: 0.6, 1.4, 3.2, 7.5, 17.3, and 40 µg/L; Time weighted average reported**	8	**8**
Analysis method stated **GC-MS**	2	**2**
Habitat described (e.g., pond, lake, ditch, artificial, lentic, lotic) **Reservoir pond**	6	**6**

Parameter[a]	Score[b]	**Points**
Water quality		
Source identified **Filtered reservoir pond water**	2	**2**
Hardness reported **Not reported**	1	**0**
Alkalinity reported **Not reported**	1	**0**
Dissolved oxygen reported **Not reported**	2	**0**
Temperature reported **Air 10 at night to 24 in daytime; water 16-22 ºC**	2	**2**
Conductivity reported **835-615 µS/cm**	1	**1**
pH reported **8-9**	1	**1**
Photoperiod reported **Ambient**	1	**1**
Organic carbon reported **Not reported**	2	**0**
Chemical fate reported **Degradation/dissipation plots**	3	**3**
Geographic location identified (Score 2 for indoor systems) **Field station at German Federal Environment Agency in Berlin, Germany**	2	**2**
Pesticide application		
Type reported (e.g., spray, dilutor, injection) **Pulses**	2	**2**
Frequency reported **Three pulses 1 week apart**	2	**2**
Date/season reported (Score 2 for indoor systems) **May-June**	2	**2**
Test endpoints		
Species abundance reported **Figure 5**	3	**3**
Species diversity reported **Figures 2-3**	3	**3**
Biomass reported N**ot reported**	2	**0**
Ecosystem recovery reported **Not reported**	2	**0**
Statistics		
Methods identified **Kruskal-Wallis, Mann-Whitney for differences from control**	2	**2**
At least 2 replicates **14 for control, 7 each of 6 treatments**	3	**3**
At least 2 test concentrations and 1 control **6 plus control**	3	**3**
Dose-response relationship observed **No**	2	**0**
Hypothesis tests		
NOEC determined **Not reported**	4	**0**
Significance level stated **0.05**	2	**2**

Parameter[a]	Score[b]	**Points**
Minimum significant difference reported **Not reported**	2	**0**
% of control at NOEC and/or LOEC reported or calculable **Not reported**	2	**0**
Total **Reliability**	100	**74**

LOEC = lowest observed effect concentration, NOEC = no observed effect concentration.
[a]Compiled from RIVM 2001, USEPA 1985 and 2003a, ECOTOX 2006, CCME 1995, ANZECC and ARMCANZ 2000, OECD 1995a, and van der Hoeven et al. 1997.
[b]Weighting based on ECOTOX 2006 and on data quality criteria in RIVM 2001 and OECD 1995a.