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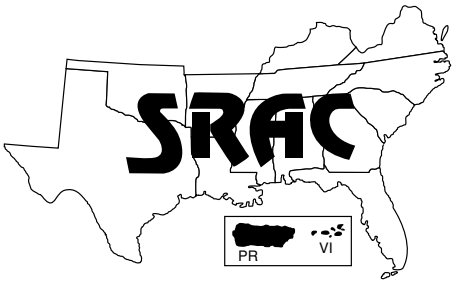

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Toxicities of Agricultural Pesticides to Selected Aquatic Organisms

E. Ruth Morgan and Martin W. Brunson[1]

Various laws require that pesticide applicators be educated about the safe application of chemicals, and that they follow precisely the label directions for all products they use. Those who apply chemicals to crops near aquaculture facilities should be aware of the potential risks of contaminating those facilities. Aquatic organisms may die as a result of pesticide contamination, or they may simply grow poorly, become more susceptible to disease, or become unsuitable for human consumption.

The sublethal effects of many agricultural chemicals on aquatic life are unknown. Any misused chemical can cause serious problems to an aquaculture operation. On the other hand, even the most toxic chemical can be used safely if it is used properly.

With careful management it is possible to protect crops from insects, weeds and diseases while at the same time preventing pesticides from harming aquacultural operations. Near aquaculture, grow crops that require little or no pest control. Scout fields for pests and use chemicals only when necessary. When a pesticide must be used, select a product that is registered for the use intended and is the least toxic and least persistent of the products available. Always follow exactly the directions on the label.

Reduce the risk of pesticide drift by:

- using low-volatility formulations;
- using low pressure;
- using high volume;
- using the largest nozzle that is practical;
- releasing spray near the crop or soil surface;
- not spraying when the temperature is high;
- spraying when the wind is low and blowing away from aquaculture facilities; and
- using spray thickeners when appropriate.

Reduce the risk of runoff by:

- delaying application if rain is expected;
- irrigating in accordance with pesticide label instructions and monitoring to avoid runoff and the accumulation of excess surface water;
- using no-tillage or minimum-tillage cropping systems that reduce pesticide runoff;
- using soil-incorporation methods;
- using adjuvants that promote the retention of pesticides on treated surfaces;
- grading the surface and constructing drainage ditches and dikes; and
- planting border vegetation.

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Toxicities of specific chemicals

Table 1 defines the categories of acute pesticide toxicities to aquatic organisms (categories for mammals are shown for comparison).

Table 2 gives the toxicity of agricultural chemicals to five species of aquatic animals: bluegill, *Lepomis machrochirus*; channel catfish, *Ictalurus punctatus*; rainbow trout, *Salmo gairdneri*; crawfish, *Procambarus* sp; and freshwater shrimp, *Palaemonetes* sp. Toxicities are based on the formulation rather than the active ingredient. Toxicities can vary significantly between warmwater and coldwater fish species and/or between fish and shellfish species. Farmers, chemical applicators and fisheries biologists should find this information useful in evaluating the risk of using a specific chemical on fields near fish ponds or natural waters.

The toxicity of these chemicals is expressed as a 96-hour LC_{50} given in parts per million (the column headed "ppm"). This represents the amount of chemical required to kill 50 percent of the fish in 96 hours. The larger the number, the less toxic the chemical is to fish; the smaller the number, the more toxic it is. A concentration of one part per million (or 1 mg/l) is equal to 2.72 pounds of material in 1 acre-foot of water (1 acre-foot equals 1 surface acre with a depth of 1 foot, or 325,850 gallons).

The weight of a chemical, in pounds, required in 1 acre-foot of water to give the 96-hour LC_{50} concentration also is listed (the column headed "lbs."). **Pesticides that are HIGHLY TOXIC (>0.1-1 ppm), EXTREMELY TOXIC (0.01-0.1 ppm), or SUPER TOXIC (<0.01 ppm) for the 96-hour LC_{50} appear in boldface.**

The toxicities listed are laboratory values and are **given only as a guideline**. These should not be considered as absolute values of the toxicity of these chemicals to channel catfish, bluegill, rainbow trout, crawfish and freshwater shrimp. Many factors influence the toxicity of chemicals to fish and shellfish, including the age, size, species and general health of fish; the temperature, pH, turbidity and other physical and chemical parameters of the water; the amount and kind of aquatic vegetation present; the concentration of the chemical and the formulation used; and the length of exposure. Aquatic toxicity may also be influenced by any surfactant/adjuvant used. Therefore, the actual amount of a chemical required to kill fish in a specific body of water may be higher or lower than the values given in this publication.

Table 1. Categories of acute toxicity of pesticides.

Aquatic Organisms

Toxicity Category	96-Hour LC_{50} (ppm)
Super Toxic	<0.01
Extremely Toxic	>0.01 to 0.1
Highly Toxic	>0.1 to 1
Moderately Toxic	>1 to 10
Slightly Toxic	>10 to 100
Practically Nontoxic	>100

Mammals

Toxicity Category	Rat Oral LD_{50} (mg/kg)	Rabbit Dermal LD_{50} (mg/kg)	Probably Lethal Oral Dose (Humans)
Super Toxic	<5	<20	Taste to grain
Extremely Toxic	5 to 50	20 to 200	pinch to tsp.
Highly Toxic	>50 to 500	>200 to 1,000	tsp. to Tbsp.
Moderately Toxic	>500 to 5,000	>1,000 to 2,000	1 oz. to 1 pt.
Slightly Toxic	5,000 to 15,000	>2,000 to 20,000	1 pt. to 1 qt.
Practically Nontoxic	>15,000	>20,000	>1 qt.

Table 2. Toxicities of agricultural pesticides to aquatic organisms.

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs.
AAtrex atrazine	H	24.0	65.2800			4.5	12.2400				
Acaraben chlorobenzilate	I					0.7	1.9040				
Accelerate endothall	H	0.94	2.5568	0.49	1.3328	0.14	0.3808			0.05	0.1360
Accent nicosulfuron	H	1000	2720.0000			1000	2720.0000				
Accord glyphosate, Rodeo	H	1000	2720.0000	130	353.6	1000	2720.0000				
acephate Orthene	I	1000	2720.0000	560	1523.2000	730	1985.6000				
acetochlor Surpass, Topnotch, Trophy	H	1.3	3.5360			0.45	1.2240			2.4	6.5280
acifluorfen Blazer	H	31.0	84.3200	80.0	217.6000	54.0	146.8800				
Actellic pirimiphos methyl	I					0.25	0.6800			0.21	0.5712
Acti-dione cycloheximide	F	1.3	3.5360	1.7	4.6240	1.2	3.2640				
Akar chlorobenzilate	I					0.7	1.9040				
alachlor	H	2.8	7.616	2.1	5.712	1.8	4.896	320	870.40		
alachlor Lasso	H	3.2	8.7040			1.4	3.8080				
Ally metsulfuron methyl, Escort	H	150	408.0000	1000	2720.0000	150	408.0000	178	484.1600		
Alanap naptalam	H	354.4	963.9680			76.1	206.9920				
aldicarb Temik	I	0.05	0.1360			0.56	1.5232				
aldrin	I	0.0062	0.0169	0.053	0.1442	0.0026	0.0071			0.05	0.1360
Altosid methoprene	I	1.52	4.1344			6.8	18.4960				
Altosid methoprene	I	1.52	4.1344			6.8	18.4960				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs.
Ambush permethrin	I	0.005	0.0136	0.0011	0.0030	0.0041	0.0112	0.0004	0.0011	0.0002	0.0005
Amdro	I	0.227	0.6174	0.1	0.2720	0.16	0.4352				
ametryn Evik	H	3.7	10.0640			3.2	8.7040				
amitraz Ovasyn	I	0.5	1.3600			0.7	1.9040				
amitrole Amitrole-T, Weedazol, Weedazol-T	H			423	1150.5600						
Amitrole-T amitrole	H			423	1150.5600						
Ammo cypermethrin	I	0.00178	0.0048			0.00092	0.0025				
Asana esfenvalerate	I	0.0022	0.0060			0.0016	0.0044				
Assure quizalofop ethyl	H			0.47	1.2784			1.4	3.8080		
anilazine Dyrene	F	0.32	0.8704	0.24	0.6528	0.15	0.4080				
Ansar 170 MSMA	H	12	32.6400	26.8	72.8960						
Apron metalaxyl	F	100	272.0000	100	272.0000	100	272.0000				
Aquathol K endothall	H	343	932.9600	150	408.0000	230	625.6000				
Aquazine simazine	H	16.0	43.5200			2.8	7.6160				
Arsenal	H	100	272.0000	100	272.0000	100	272.0000				
Asana esfenvalerate	I	0.0022	0.0060			0.0016	0.0044				
Asana quizalofop-p-methyl, Assure	H	0.46	1.2512	0.47	1.2784	0.87	2.3664	1.4	3.8080		
Assure quizalofop methyl	H	0.47	1.2784					1.4	3.8080		
atrazine AAtrex	H	24.0	65.2800			4.5	12.240				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs.
Attac toxaphene	I	0.0024	0.0065	0.0131	0.0356	0.0106	0.0288				
azinphos-ethyl Crysthion, Ethyl Guthion	I	0.0011	0.0030			0.02	0.0544	2.23	6.0656		
azinphos-methyl Guthion	I	0.022	0.0598	3.29	8.9488	0.0043	0.0117	0.056	0.1523	0.0013	0.0035
Azodrin 3.2 monocrotophos	I	12.1 (ai)	32.9120	4.93	13.4096	5.2	14.1440				
Bacillus thuringiensis	I	95	258.4000								
Banvel dicamba	H	100	272.0000			99	269.2800				
Barricade prodiamine	H	552	1501.4400			829	2254.8800				
Basagran bentazon	H	1060	2883.2000			635	1727.2000				
Basalin fluchloralin	H					0.01	0.0272				
Basfapon dalapon	H	105	285.6000			100	272.0000				
Bataion halosulfuron	H	118	321			131	356			109	297
Baygon propoxur	I	4.8	13.0560	1.3	3.5360	3.7	10.0640				
Bayleton triadimefon	F			15	40.8000						
Baytex 46% fenthion	I	1.38	3.7536	1.6	4.3520	0.93	2.5296			0.01	0.0272
Baythroid cyfluthrin	I	0.0015	0.0041			0.00068	0.0018				
Belt chlordane	I	0.057	0.1550	0.0067	0.0182	0.042	0.1142				
bendiocarb Turcam	I	1.65	4.4880			1.55	4.2160				
Benlate benomyl	F	0.85	2.3120	0.016	0.0435	0.17	0.4624	1032	2807.0400	45.8 (f)	124.5760
benomyl Benlate	F	0.85	2.3120	0.016	0.0435	0.17	0.4624	1032	2807.0400	45.8 (f)	124.5760

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
bensulfuron Londax	H	150	408.0000	150	408.0000	150	408.0000	71	193.1200		
bensulfuron methyl Londax	H			150	408.0000			71	193.1200		
bensulide **Betasan, Prefar, Pre-San**	H	0.8	2.1760			0.7	1.9040				
bentazon Basagran	H	1060	2883.2000			635	1727.2000				
benzene hexachloride **BHC**	I	0.067	0.1822	0.105	0.2856	0.018	0.0490				
Betasan **bensulide**	H	0.8	2.1760			0.7	1.9040				
BHC **benzene hexachloride**	I	0.067	0.1822	0.105	0.2856	0.018	0.0490				
Bidrin dicrotophos	I	24.2	65.8240	7.7	20.9440	6.3	17.1360	3.0 (a)	8.1600		
bifenox **Modown 21%**	H	0.47	1.2784			2.6	7.0720	1338	3639.3600		
biphenthrin **Capture**	I	0.35	0.9520			15	0.4080			1.6	4.3520
Bladex 4L cyanazine	H			11.3	30.7360						
Bladex 80W cyanazine	H	22.5	61.2000	10.4	28.2880	9.0	24.4800				
Blazer acifluorfen	H	31.0	84.3200	80.0	217.6000	54.0	146.8800				
Blue Vitriol copper sulfate	F	Toxicity depends on total alkalinity of water. Can be very toxic in water with low alkalinity.									
Bluestone copper sulfate	F	Toxicity depends on total alkalinity of water. Can be very toxic in water with low alkalinity.									
Bolero 8EC thiobencarb	H	1.7	4.6240	2.3	6.2560	1.05	2.8560	6.5	17.6800		
Bolstar 6EC sulprofos	I	1.03	2.8016	2.9	7.8880	9.4	25.5680				
Broadstrike flumetsulam	H	300	816.0000			300	816.0000			349	949.2800

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
bromacil Bromax, Hyvar	H	71.0 (b)	193.1200			28.0 (a)	76.1600				
Bromax bromacil	H	71.0 (b)	193.1200			28.0 (a)	76.1600				
bromoxynil **Buctril**	H	0.061	0.1659	0.063	0.1714	0.10	0.2720				
Broot trimethacarb	I	3.0	8.1600			4.7	12.7840				
Brush-Off monuron TCA	H	1.5	4.0800	63.1	171.6320						
Bronco alachlor/glyphosate	H	13	35.360			7.5	20.400				
Buctril **bromoxynil**	H	0.061	0.1659	0.063	0.1714	0.10	0.2720				
bufencarb **Bux**	I							0.279	0.7589	0.001	0.0027
Bullet alachlor/atrazine	H			41	111.520	5.4	14.688				
Busan	F	2.7	7.3440			2.4	6.5280				
butoxone (2,4-DB), Butyrac	H	7.5	20.4000			4.0	10.8800				
Butyrac butoxone	H	7.5	20.4000			4.0	10.8800				
Bux **bufencarb**	I							0.279	0.7589	0.001	0.0027
Caparol prometryn	H	6.0	16.3200			2.5	6.8000				
captafol **Difolatan**	F	0.059	0.1605	0.028	0.0762	0.021	0.0571				
captan **Orthocide**	F	0.141	0.3835	0.0775	0.2108	0.0732	0.1991	15631	42516.3200		
Capture **biphenthrin**	I	0.35	0.9520			0.15	0.4080			1.6	4.3520
carbaryl **Sevin**	I	6.76	18.3872	15.8	42.9760	1.95	5.3040	0.5	1.3600	0.0056	0.0152
carbofuran **Furadan**	I	0.13	0.3536	0.21	0.5712	0.38	1.0336	0.5	1.3600		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
carbophenothion Trithion	I	0.013	0.0354	6.0	16.3200					0.0012	0.0033
carboxin Vitavax	F	1.2	3.2640			2.0	5.4400	217 (f)	590.2400	14.0	38.0800
Carzol formetanate hydrochloride	I	20.0	54.4000			2.8	7.6160				
Casoron dichlobenil	H	8.3	22.5760			6.3	17.1360				
chlordane Belt	I	0.057	0.1550	0.0067	0.0182	0.042	0.1142				
chlordimeform Fundal, Galecron	I	2.4	6.5280	20.2	54.9440	13.2	35.9040				
chlorimuron Classic	H	100	272.0000	950	2584.0000	1000	2720.0000	1000	2720.0000		
chlorobenzilate Acaraben, Akar	H					0.7	1.9040				
chloroxuron Norex, Tenoran	H			0.45	1.2240	0.43	1.1696				
chlorpyrifos Dursban, Lorsban	I	0.0024	0.0065	0.28	0.7616	0.0071	0.0193	0.041	0.1115	0.0024 (b)	0.0065
chlorsulfuron Glean, Telar	H	300	816.0000	50	136.0000	250	680.0000	1000	2720.0000		
Chrysron resmethrin	I	0.0017	0.0046	0.016	0.0435						
Ciodrin crotoxyphos	I	0.152	0.4134	2.6	7.0720	0.0724	0.1969				
Classic chlorimuron	H	100	272.0000	950	2584.0000	1000	2720.0000	1000	2720.0000		
clomazone Command	H	34	92.4800			19	51.6800				
clopyralid Curtail, Stinger	H	100	272.0000			100	272.0000				
Cobex dinitramine	H	1.52	4.1344	1.37	3.7264	0.82	2.2304				
Comite propargite	I	0.1	0.2720	0.12	0.3264	0.101	0.2747				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Command clomazone	H	34	92.4800			19	51.6800				
Concept cyometrinil	H	10.9	29.6480			5.6	15.2320				
copper ammonium carbonate Copper Count N	F	3.28	8.9216			0.0204	0.0555				
Copper Count N copper ammonium carbonate	F	3.28	8.9216			0.0204	0.0555				
copper hydroxide Kocide	F	180	489.6000			0.08	0.2176	2918	7936.9600		
copper sulfate Bluestone, Blue Vitriol, Tribasic copper sulfate	F	Toxicity depends on total alkalinity of water. Can be very toxic in water with low alkalinity.									
Co-Ral coumaphos	I	0.34	0.9248	0.84	2.2848	0.89	2.4208				
Cotoran fluometuron	H	96	261.1200	0.6	1.6320	3.0	8.1600				
coumaphos Co-Ral	I	0.34	0.9248	0.84	2.2848	0.89	2.4208				
crotoxyphos Ciodrin	I	0.152	0.4134	2.6	7.0720	0.0724	0.1969				
crufomate Ruelene	I	1.8	4.8960								
cryolite Kryocide	I	400	1088.0000			47.0	127.8400				
Crysthion azinphos-ethyl	I	0.0011	0.0030			0.02	0.0544	2.23	6.0656		
Curacron profenofos	I	0.3	0.8160	0.02	0.0544						
Curtail clopyralid	H	100	272.0000			100	272.0000				
cyanazine Bladex 4L, Bladex 80W	H	See specific trade name for toxicity data.									
cycloheximide Acti-dione	F	1.3	3.5360	1.7	4.6240	1.2	3.2640				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
cyfluthrin Baythroid	I	0.0015	0.0041			0.00068	0.0018				
Cygon dimethoate	I	6.0	16.3200			6.2	16.8640	0.1	0.2720		
Cymbush cypermethrin	I	0.00178	0.0048			0.00092	0.0025				
cyometrinil Concep	H	10.9	29.6480			5.6	15.2320				
cypermethrin Ammo, Cymbush	I	0.00178	0.0048			0.00092	0.0025				
Cythion malathion	I	0.103	0.2802	8.97	24.3984	0.2	0.5440	50.0	136.0000	0.09	0.2448
dalapon Dowpon, Radapon	H	See specific trade name for toxicity data.									
DCPA	H	100	272.0000								
DDT dichloro diphenyl trichloroethane	I	0.0086	0.0234	0.0215	0.0585	0.0087	0.0237	0.028	0.0762	0.0023	0.0063
DDVP dichlorvos	I	0.869	2.3637								
Dechloran mirex	I	100	272.0000			100	272.0000	20	54.4000		
DEF	H	0.62	1.6864	0.66	1.7952	0.66	1.7952			0.028	0.0762
Degree Xtra acetochlor/atrazine	H					2.9	7.88				
Delnav dioxathion	I					0.069	0.1877				
demeton Systox	I	0.1	0.2720	3.7	10.0640	0.69	1.8768			0.048	0.1306
Des-I-Cate endothall	H					0.31	0.8432				
diazinon Spectracide	I	0.168	0.4570			0.09	0.2448				
Dibrom naled	I	2.2	5.9840	0.71	1.9312	0.195	0.5304	4.0 (a)	10.8800	0.092	0.2502
dicamba Banvel	H	100	272.0000			99	269.2800				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
dichlobenil Casoron	H	8.3	22.5760			6.3	17.1360				
dichlorprop 2,4-DP	H	0.75	2.0400			1.3	3.5360				
dichlorvos DDVP, Vapona	I	0.869	2.3637								
dicofol Kelthane	I	0.52	1.4144	0.36	0.9792						
dicrotophos Bidrin	I	24.2	65.8240	7.7	20.9440	6.3	17.1360	3.0 (a)	8.1600		
dieldrin	I	0.0031	0.0084	0.0045	0.0122	0.0012	0.0033	0.74	2.0128		
diflubenzuron Dimilin	I	100	272.0000	100	272.0000	100	272.0000				
Difolatan captafol	F	0.059	0.1605	0.028	0.0762	0.021	0.0571				
Dimecron phosphamidon	I	3.4	9.2480	70	190.4000	7.8	21.2160	5.5 (a)	14.9600		
Dimension dithiopyr	H	0.7	1.9040			0.48	1.3056				
dimethenamid Frontier	H	6.4	17.4080			2.1	5.7120				
dimethoate Cygon, Rebelate	I	6.0	16.3200			6.2	16.8640	0.1	0.2720		
Dimilin diflubenzuron	I	100	272.0000	100	272.0000	100	272.0000				
dinitramine Cobex	H	1.52	4.1344	1.37	3.7264	0.82	2.2304				
dinocap Karathane	F	0.02	0.0544			0.015	0.0408				
dinoseb Premerge 3	H					0.07	0.1904				
dioxathion Delnav	I					0.069	0.1877				
diphenamid Dymid, Enide	H									32	87.0400
Dipterex trichlorfon	I	0.26	0.7072	0.88	2.3936	1.4	3.8080	7.8	21.2160		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
diquat	H	245	666.4000			10	27.2000				
disulfoton Di-Syston	I	0.39	1.0608	4.7	12.7840	1.85	5.0320			0.0039	0.0106
Di-Syston disulfoton	I	0.39	1.0608	4.7	12.7840	1.85	5.0320			0.0039	0.0106
Dithane M-22 maneb	F	1.0	2.7200			1.9	5.1680	40.0 (a)	108.8000		
Dithane M-45 mancozeb	F	1.0	2.7200	4.5	12.2400			40.0 (a)	108.8000		
dithiopyr Dimension	H	0.7	1.9040			48	1.3056				
diuron Karmex	H	8.2	22.3040			4.9	13.3280				
Dowpon dalapon	H	500	1360.0000								
Dropp thidiazuron	H	1000	2720.0000	1000	2720.0000	1000	2720.0000				
Du-Ter triphenyltin hydroxide	F	0.023	0.0626			0.028	0.0762				
Dual metolachlor	H	10.0	27.2000	4.9	13.3280	2.0	5.4400				
Dursban chlorpyrifos	I	0.0024	0.0065	0.28	0.7616	0.0071	0.0193	0.041	0.1115		
Dyanap naptalam + dinoseb	H	0.56	1.5232			0.13	0.3536				
Dyfonate fonofos	I	0.007	0.0190			0.02	0.0544				
Dylox trichlorfon	I	0.26	0.7072	0.88	2.3936	1.4	3.8080	7.8	21.2160		
Dymid diphenamid	H									32	87.0400
Dyrene anilazine	F	0.32	0.8704	0.24	0.6528	0.15	0.4080				
endosulfan Thiodan	I	0.0012	0.0033	0.0015	0.0041	0.0014	0.0038				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
endothall Accelerate, Aquathol K, Des-I-Cate, Hydrothall 191	H	See specific trade name for toxicity data.									
endrin	I	0.00061	0.0017	0.00032	0.0009	0.00075	0.0020	0.3	0.8160	0.0032	0.0087
Enide diphenamid	H									32.0	87.0400
Entex **fenthion**	I	0.75	2.0400	1.6	4.3520	0.87	2.3664			0.01	0.0272
EPN	I	0.08	0.2176	0.42	1.1424	0.19	0.5168			0.0006	0.0016
Escort metsulfuron methyl	H	150	408.0000	1000	2720.0000	150	408.0000	178	484.1600		
esfenvalerate **Asana**	I	0.0022	0.0060			0.0016	0.0044				
ethalfluralin **Sonalan**	H	0.1020	0.2774			0.136	0.3699	0.230	0.6256		
ethion	I	0.21	0.5712	7.6	20.6720	0.5	1.3600			0.0056	0.0152
ethofumesate Prograss	H	320	870.4000			180	489.6000				
Ethyl Guthion **azinphos-ethyl**	I	0.0011	0.0030			0.02	0.0544	2.23	6.0656		
ethyl parathion **Parathion**	I	0.4	1.0880	2.65	7.2080	1.43	3.8896	0.25	0.6800	0.0015	0.0041
Evik ametryn	H	3.7	10.0640			3.2	8.7040				
Express tribenuron methyl	H	1000	2720.0000			1000	2720.0000				
Facet quinclorac	H	100	272.0000			100	272.0000			67	182.2400
fenac Fenatrol	H	41	111.5200								
Fenatrol fenac	H	41	111.5200								
fenthion **Baytex, Entex, Tiguvon**	I	0.75	2.0400	1.6	4.3520	0.87	2.3664			0.01	0.0272
fenvalerate **Pydrin**	I	0.0006	0.0016	0.001	0.0027	0.0006	0.0016			0.001	0.0027

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
fluazifop-butyl Fusilade 4E	H					1.6	4.3520				
fluchloralin Basalin	H					0.01	0.0272				
flucythrinate Payoff	I	0.00071	0.0019	0.00051	0.0014	0.00032	0.0009			0.00028	0.0008
Flumetsulam Broadstrike	H	300	816.0000			300	816.0000			349	949.2800
fluridone Sonar	H	13	35.3600	8.2	22.3040						
fluvalinate Mavrik	I	0.0062	0.0169			0.0027	0.0073				
Folex merphos	H	18.2	49.5040			5.8	15.7760				
folpet Phaltan	F	0.072	0.1958	0.108	0.2938	0.039	0.1061				
fonofos Dyfonate	I	0.007	0.0190			0.02	0.0544				
formetanate hydrochloride Carzol	I	20.0	54.4000			2.8	7.6160				
fosamine ammonium Krenite	H	670 (f)	1822.4000			1000 (f)	2720.0000				
Frontier dimethenamid	H	6.4	17.4080			2.1	5.7120				
Fundal chlordimeform	I	2.4	6.5280	20.2	54.9440	13.2	35.9040				
Funginex triforine	F	1000	2720.0000			1000	2720.0000				
Furadan carbofuran	I	0.13	0.3536	0.21	0.5712	0.38	1.0336	0.5	1.3600		
Fury zeta-cypermethrin	I					0.00069	0.0019				
Fusilade 4E fluazifop-butyl	H					1.6	4.3520				
Galecron chlordimeform	I	2.4	6.5280	20.2	54.9440	13.2	35.9040				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Gallery isoxaben, Snapshot	H	1.1	2.9920			1.1	2.9920			100	272.0000
Garlon 3A triclopyr	H	400	1088.0000	447	1215.8400	552	1501.4400	326	886.7200		
Garlon 4 triclopyr	H	0.36	0.9792			0.65	1.7680				
Glean chlorsulfuron, Telar	H	300	816.0000	50	136.0000	250	680.0000	1000	2720.0000		
glyphosate Accord, Rodeo	H	1000	2720	130	353.6	1000	2720				
Goal oxyfluorfen	H	HIGHLY TOXIC to aquatic animals.									
Gramoxone paraquat	H	5	13.6000			5	13.6000				
Guthion azinphos-methyl	I	0.022	0.0598	3.29	8.9488	0.0043	0.0117	0.056	0.1523	0.00013	0.0004
halosulfuron Battalion, Manage, Permit, Sempra	H	118	321			131	356			109	297
Harmony thifensulfuron	H	100	272.0000	360	979.2000	100	272.0000	79	214.8800		
Harness Xtra acetochlor/atrazine)	H					2.9	7.88				
heptachlor	I	0.0053	0.0144	0.025	0.0680	0.0074	0.0201			0.0018	0.0049
hexachlorobenzene	F	12.0	32.6400	14.0	38.0800						
hexazinone Velpar	H	370	1006.4000			320	870.4000			56	152.3200
Hydrothall 191 endothall	H	0.94	2.5568	0.49	1.3328	0.56	1.5232			0.05	0.1360
Hyvar bromacil	H	71.0 (b)	193.1200			28.0 (a)	76.1600				
Igran terbutryn	H	2.7	7.3440	2.9	7.8880	0.82	2.2304				
Imidan phosmet	I	0.16	0.4352	7.5	20.4000	0.3	0.8160				
iprodione Rovral	F	6.0	16.3200			4.0	10.8800				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
isoxaben Gallery, Snapshot	H	1.1	2.9920			1.1	2.9920			100	272.0000
Karathane dinocap	F	0.02	0.0544			0.015	0.0408				
Karmex diuron	H	8.2	22.3040			4.9	13.3280				
Kelthane dicofol	I	0.52	1.4144	0.36	0.9792						
Kocide copper hydroxide	F	180	489.6000			0.08	0.2176	2918	7936.9600		
Korlan ronnel	I	1.3	3.5360	1.6	4.3520	0.55	1.4960				
Krenite fosamine ammonium	H	670 (f)	1822.4000			1000 (f)	2720.0000				
Kryocide cryolite	I	400	1088.0000			47.0	127.8400				
Lanex fluometuron	H	96.0	261.1200	0.6	1.6320	3.0	8.1600				
Lannate methomyl	I	0.875	2.3800	0.92	2.5024	3.4	9.2480	1.0	2.7200		
Lariat Flowable alachlor/atrazine	H			41	111.520	5.4	14.688				
Larvin thiodicarb	I	1.21	3.2912			2.55	6.9360			0.56	1.5232
Lasso Microtech alachlor	H			58	157.760			1.4	3.8080		
leptophos Phosvel	I	0.022	0.0598			0.02	0.0544	7.0	19.0400		
Lexone metribuzin	H	80.0	217.6000	10	27.2000	76.0	206.7200			3.4	9.2480
Lime sulfur	F	49.0	133.2800			8.0	21.7600				
lindane	I	0.068	0.1850	0.044	0.1197	0.027	0.0734				
linuron Lorox	H	16.2	44.0640			16.4	44.6080	40	108.8000		
Londax bensulfuron	H	150	408.0000	150	408.0000	150	408.0000	78	212.1600		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Lorox linuron	H	16.2	44.0640			16.4	44.6080	40	108.8000		
Lorsban chlorpyrifos	I	0.0024	0.0065	0.28	0.7616	0.0071	0.0193	0.041	0.1115	0.0024 (b)	0.0065
malathion Cythion	I	0.103	0.2802	8.97	24.3984	0.2	0.5440	50.0	136.0000	0.09	0.2448
Manage halosulfuron	H	118	321			131	356			109	297
mancozeb Dithane M-45	F	1.0	2.7200	4.5	12.2400					40.0 (a)	108.8000
maneb Dithane M-22	F	1.0	2.7200			1.9	5.1680			40.0 (a)	108.8000
Marlate methoxychlor	I	0.032	0.0870	0.052	0.1414	0.062	0.1686			0.00105	0.0029
Mavrik fluvalinate	I	0.0062	0.0169			0.0027	0.0073				
merphos Folex	H	18.2	49.5040			5.8	15.7760				
Mesurol methiocarb	I	0.75	2.0400	4.6	12.5120	0.43	1.1696			0.032	0.0870
metalaxyl Apron, Ridomil, Subdue	F	100	272.0000	100	272.0000	100	272.0000				
Metasystox-R oxydemetonmethyl	I	14.0	38.0800	18.0	48.9600	6.4	17.4080				
methamidophos Monitor	I	34.0	92.4800			25.0	68.0000				
methazole Probe	H	4.5	12.2400								
methidathion Supracide	I	0.0022	0.0060			0.014	0.0381				
methiocarb Mesurol	I	0.75	2.0400	4.6	12.5120	0.43	1.1696			0.032	0.0870
methomyl Lannate	I	1.5	4.0800			5.6	15.2320				
methoprene Altosid	I	1.52	4.1344			6.8	18.4960				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
methoxychlor Marlate	I	0.032	0.0870	0.052	0.1414	0.062	0.1686			0.00105	0.0029
methyl parathion	I	4.38	11.9136	5.24	14.2528	3.7	10.0640	0.04 (a)	0.1088		
Methyl trithion	I	0.96	2.6112	2.8	7.6160	0.76	2.0672				
metolachlor Dual	H	15.0	40.8000	4.9	13.3280	2.0	5.4400				
metribuzin Lexone, Sencor	H	80.0	217.6000	10	27.2000	76.0	206.7200			3.4	9.2480
metribuzin metsulfuron methyl, Ally, Escort	H	150	408.0000	1000	2720.0000	150	408.0000	178	484.1600		
mevinphos Phosdrin	I	0.0225	0.0612			0.0119	0.0324				
mexacarbate Zectran	I	0.32	0.8704	11.4	31.0080	12.0	32.6400	1.2	3.2640		
Milogard propazine	H	100	272.0000			18.0	48.9600				
mirex Dechloran	I	100	272.0000			100	272.0000	20.0	54.4000		
Modown 21% bifenox	H	0.47	1.2784			2.6	7.0720	1338	3639.3600		
molinate Ordram	H	0.29	0.7888	32.6	88.6720	13.0	35.3600	14.0	38.0800		
Monitor methamidophos	I	34.0	92.4800			25.0	68.0000				
monocrotophos Azodrin 3.2	I	12.1 (ai)	32.9120	4.93	13.4096	5.2	14.1440				
monuron TCA Brush-Off, Urox	H	1.5	4.0800	63.1	171.6320						
MSMA Ansar 170	H	12.0	32.6400	26.8	72.8960						
naled Dibrom	I	2.2	5.9840	0.71	1.9312	0.195	0.5304	4.0 (a)	10.8800	0.092	0.2502
naptalam Alanap	H	354.4	963.9680			76.1	206.9920				
Neguvon trichlorfon	I	0.26	0.7072	0.88	2.3936	1.4	3.8080	7.8	21.2160		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
nicosulfuron Accent	H	1000	2720.0000			1000	2720.0000				
Norex chloroxuron	H			0.45	1.2240	0.43	1.1696				
norflurazon Zorial	H	16.3	44.3360			8.1	22.0320				
Omite propargite	I	0.1	0.2720			0.12	0.3264			0.101	0.2747
Ordram molinate	H	0.29	0.7888	32.6	88.6720	13.0	35.3600	14.0	38.0800		
Orthene acephate	I	1000	2720.0000	560	1523.2000	730	1985.6000				
Orthocide captan	F	0.141	0.3835	0.0775	0.2108	0.0732	0.1991	15631	42516.3200		
oryzalin Surflan	H	2.88	7.8336			3.26	8.8672				
Oust sulfometuron methyl	H	12.5	34.0000	12.5	34.0000	12.5	34.0000	5000	13600.0000		
Ovasyn amitraz	I	0.5	1.3600			0.7	1.9040				
oxamyl Vydate L	I	5.6	15.2320	11.7	31.8240	4.2	11.4240				
oxycarboxin Plantvax	F	28.1	76.4320			19.9	54.1280				
oxydemetonmethyl Metasystox-R	I	14.0	38.0800	18.0	48.9600	6.4	17.4080				
oxyfluorfen Goal	H	HIGHLY TOXIC to aquatic animals.									
paraquat	H	13.0	35.3600	100	272.0000	15.0	40.8000	1.4	3.8080		
Parathion ethyl parathion	I	0.4	1.0880	2.65	7.2080	1.43	3.8896	0.25	0.6800	0.0015	0.0041
Payoff flucythrinate	I	0.00071	0.0019	0.00051	0.0014	0.00032	0.0009			0.00028	0.0008
pendimethalin Prowl	H	0.199	0.5413	0.418	1.1370						
permethrin Ambush, Pounce	I	0.005	0.0136	0.0011	0.0030	0.0041	0.0112	0.0004	0.0011	0.0002	0.0005

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Permit halsulfuron	H	118	321			131	356			109	297
Phaltan folpet	F	0.072	0.1958	0.108	0.2938	0.039	0.1061				
phorate Thimet	I	0.002	0.0054	0.28	0.7616	0.013	0.0354				
phosalone Zolone	I	0.05	0.1360			0.63	1.7136			0.00075	0.0020
Phosdrin mevinphos	I	0.0225	0.0612			0.0119	0.0324				
phosmet Imidan	I	0.16	0.4352	7.5	20.4000	0.3	0.8160				
phosphamidon Dimecron, Swat	I	3.4	9.2480	70.0	190.4000	7.8	21.2160	5.5 (a)	14.9600		
Phosvel leptophos	I	0.022	0.0598			0.02	0.0544	7.0	19.0400		
picloram Tordon	H	23.0	62.5600	1.4	3.8080	4.0	10.8800				
piperonyl butoxide	I	0.0042	0.0114			0.0034	0.0092				
pirimiphos methyl Actellic	H					0.25	0.6800			0.21	0.5712
Plantvax oxycarboxin	F	28.1	76.4320			19.9	54.1280				
Poast sethoxydim	H	265	720.8000	150	408.0000	170	462.4000				
Pounce permethrin	I	0.005	0.0136	0.0011	0.0030	0.0041	0.0112	0.0004	0.0011	0.0002	0.0005
Prefar bensulide	H	0.8	2.1760			0.7	1.9040				
Premerge 3 dinoseb	H					0.07	0.1904				
Pre-San bensulide	H	0.8	2.1760			0.7	1.9040				
Princep simazine	H	16.0	43.5200			2.8	7.6160				
Probe methazole	H	4.5	12.2400								

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
prodiamine Barricade, Regalkade	H	552	1501.4400			829	2254.8800				
profenofos Curacron	I	0.3	0.8160	0.02	0.0544						
profluralin Tolban	H	0.023	0.0626								
Prograss ethofumesate	H	320	870.4000			180	489.6000				
Prometon	H	32.0	87.0400			20.0	54.4000				
prometryn Caparol	H	6.0	16.3200			2.5	6.8000				
propachlor Ramrod	H	0.42	1.14	0.23	.6256	0.17	0.4624				
propanil Stam	H			6.13	16.6736			7.9	21.4880		
propargite Comite, Omite	I	0.1	0.2720			0.12	0.3264			0.101	0.2747
propazine Milogard	H	100	272.0000			18.0	48.9600				
propiconazole Tilt	H	1.3	3.5360	2.0	5.4400						
propoxur Baygon	I	4.8	13.0560	1.3	3.5360	3.7	10.0640				
Prowl pendimethalin	H	0.199	0.5413	0.418	1.1370						
Proxol trichlorfon	I	0.94	2.5568	0.88	2.3936	0.7	1.9040	7.8	21.2160		
Pydrin fenvalerate	I	0.0006	0.0016	0.001	0.0027	0.0006	0.0016			0.001	0.0027
Pyrethrins Pyrethrum	I	0.058	0.1578	0.009	0.0245						
Pyrethrum Pyrethrins	I	0.058	0.1578	0.009	0.0245						
quinclorac Facet	H	100	272.0000			100	272.0000			67	182.2400
quizalofop-p-methyl Assure	H	0.46	1.2512	0.47	1.2784	0.87	2.3664	1.4	3.8080		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Radapon dalapon	H	105	285.6000			100	272.0000				
Ramrod propachlor	H	0.42	1.14	0.23	.6256	0.17	0.4624				
Rebelate dimethoate	I	6.0	16.3200			6.2	16.8640	0.1	0.2720		
Reflex	H	6030	16401.6000			680	1849.6000				
Regalkade prodiamine	H	552	1501.4400			829	2254.8800				
resmethrin Chrysron, Synthrin	I	0.0017	0.0046	0.016	0.0435						
Ridomil metalaxyl	F	100	272.0000	100	272.0000	100	272.0000				
Rodeo glyphosate	H	1000	2720.0000	130	353.6	1000	2720.0000				
ronnel Korlan, Trolene, Viozene	I	1.3	3.5360	1.6	4.3520	0.55	1.4960				
rotenone	I	0.023	0.0626	0.0026	0.0071	0.031	0.0843				
Roundup glyphosate	H	5.8	15.776	10.6	28.832	8.3	22.5760			281	764.320
Rovral iprodione	F	6.0	16.3200			4.0	10.8800				
Ruelene crufomate	I	1.8	4.8960								
Scout tralomethrin	I	0.049	0.1333			0.12	0.3264				
Sempra halosulfuro	H	118	321			131	356			109	297
Sencor metribuzin	H	80.0	217.6000	10	27.2000	76.0	206.7200			3.4	9.2480
sethoxydim Poast	H	265	720.8000	150	408.0000	170	462.4000				
Sevin carbaryl	I	6.76	18.3872	15.8	42.9760	1.95	5.3040	0.5	1.3600	0.0056	0.0152
siduron Tupersan	H							40.0	108.8000		

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
simazine Aquazine, Princep	H	16.0	43.5200			2.8	7.6160				
Sinbar terbacil	H	102.9	279.8880			46.2	125.6640			56.4 (f)	153.4080
Sinbar isoxaben, Gallery	H	1.1	2.9920			1.1	2.9920			100	272.0000
Sonalan ethalfluralin	H	0.102	0.2774			0.136	0.3699	0.230	0.6256		
Sonar fluridone	H	13	35.3600	8.2	22.3040						
Spectracide diazinon	I	0.168	0.4570			0.09	0.2448				
Spike tebuthiuron	H	112	304.6400			144	391.6800				
Stam propanil	H			6.13	16.6736			7.9	21.4880		
Stinger clopyralid	H	100	272.0000			100	272.0000				
Subdue metalaxyl	F	100	272.0000	100	272.0000	100	272.0000				
sulfometuron methyl Oust	H	12.5	34.0000	12.5	34.0000	12.5	34.0000	5000	13600.0000		
sulfosulfuron Outrider	H	96	261.1			95	2584			106	2883
sulprofos Bolstar 6EC	I	1.03	2.8016	2.9	7.8880	29.7	80.7840				
Supracide methidathion	I	0.0022	0.0060			0.014	0.0381				
Surflan oryzalin	H	2.88	7.8336			3.26	8.8672				
Surpass acetochlor	H	1.3	3.5360			0.45	1.2240			2.4	6.5280
Synthrin resmethrin	I	0.0017	0.0046	0.016	0.0435						
Systox demeton	I	0.1	0.2720	3.7	10.0640	0.69	1.8768			0.048	0.1306

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
tebuthiuron Spike	H	112	304.6400			144	391.6800				
Telar chlorsulfuron, Glean	H	300	816.0000	50	136.0000	250	680.0000	1000	2720.0000		
Temik aldicarb	I	0.05	0.1360			0.56	1.5232				
Tenoran chloroxuron	H			0.45	1.2240	0.43	1.1696				
terbacil Sinbar	H	102.9	279.8880			46.2	125.6640			56.4 (f)	153.4080
Terbutryn Igran	H	2.7	7.3440	2.9	7.8880	0.82	2.2304				
thidiazuron Dropp	H	1000	2720.0000	1000	2720.0000	1000	2720.0000				
thifensulfuron Harmony	H	100	272.0000	360	979.2000	100	272.0000	79	214.8800		
Thimet phorate	I	0.002	0.0054	0.28	0.7616	0.013	0.0354				
thiobencarb Bolero 8EC	H	1.7	4.6240	2.3	6.2560	1.2	3.2640	6.5	17.6800		
Thiodan endosulfan	I	0.0012	0.0033	0.0015	0.0041	0.0014	0.0038				
thiodicarb Larvin	I	1.21	3.2912			2.55	6.9360			0.56	1.5232
thiram	F	0.23 (b)	0.6256	0.63 (b)	1.7136	0.13 (b)	0.3536	4.3	11.6960		
Tiguvon fenthion	I	0.75	2.0400	1.6	4.3520	0.87	2.3664			0.01	0.0272
Tilt propiconazole	H	1.3	3.5360	2.0	5.4400						
Tolban profluralin	H	0.023	0.0626								
Topnotch acetochlor	H	1.3	3.5360			0.45	1.2240			2.4	6.5280
Tordon picloram	H	23.0	62.5600	1.4	3.8080	4.0	10.8800				
toxaphene Attac, Vertac	I	0.0024	0.0065	0.0131	0.0356	0.0106	0.0288				

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
tralomethrin Scout	I	0.049	0.1333			0.12	0.3264				
Treflan trifluralin	H	0.058	0.1578	2.2	5.9840	0.041	0.1115	13	35.360	0.035	0.10064
triadimefon Bayleton	F			15.0	40.8000						
Tribasic copper sulfate copper sulfate	F	Toxicity depends on total alkalinity of water. Can be very toxic in water with low alkalinity.									
tribenuron Express	H	1000	2720.0000			1000	2720.0000				
trichlorfon Dipterex, Dylox, Neguvon, Proxol	I	0.26	0.7072	0.88	2.3936	1.4	3.8080	7.8	21.2160		
triclopyr acid	H	148	402.5600			117	318.2400				
trifluralin Treflan	H	0.058	0.1578	2.2	5.9840	0.041	0.1115	13	35.360	0.037	0.10064
triforine Funginex	F	1000	2720.0000			1000	2720.0000				
trimethacarb Broot	I	3.0	8.1600			4.7	12.7840				
triphenyltin hydroxide Du-Ter	F	0.023	0.0626			0.028	0.0762				
Trithion carbophenothion	I	0.013	0.0354	6.0	16.3200					0.0012	0.0033
Trolene ronnel	I	1.3	3.5360	1.6	4.3520	0.55	1.4960				
Trophy acetochlor	H	1.3	3.5360			0.45	1.2240			2.4	6.5280
Tupersan siduron	H							40.0	108.8000		
Turcam bendiocarb	I	1.65	4.4880			1.55	4.2160				
Urox monuron TCA	H	1.5	4.0800	63.1	171.6320						
Vapona dichlorvos	I	0.869	2.3637								
Velpar hexazinone	H	370	1006.4000			320	870.4000			56.0	152.3200

Table 2. Toxicities of agricultural pesticides to aquatic organisms. (continued)

Pesticide name[1]	Type[2]	Bluegill		Channel catfish		Rainbow trout		Crawfish		Freshwater shrimp	
		ppm	lbs	ppm	lbs.	ppm	lbs.	ppm	lbs.	ppm	lbs
Vernan vernolate	H	2.5	6.8000			4.3	11.6960			0.53	1.4416
vernolate Vernan	H	2.5	6.8000			4.3	11.6960			0.53	1.4416
Vertac toxaphene	I	0.0024	0.0065	0.0131	0.0356	0.0106	0.0288				
Viozene ronnel	I	1.3	3.5360	1.6	4.3520	0.55	1.4960				
Vitavax carboxin	F	1.2	3.2640			2.0	5.4400	217 (f)	590.2400	14.0	38.0800
Vydate oxamyl	I	5.6	15.2320	11.7	31.8240	4.2	11.4240				
Weedar 64 2,4-D	H	0.6	1.6320	0.3	0.8160	0.25	0.6800	1389	3778.0800	0.15	0.4080
Weedazol amitrole	H			423	1150.5600						
Weedazol-T amitrole	H			423	1150.5600						
Weedone 170 2,4-DP + 2,4-D	H	No toxicity data available for specified aquatic animals.									
Weedone DP 2,4-DP + 2,4-D	H	2.37	6.4464			5.32	14.4704				
Zectran mexacarbate	I	0.32	0.8704	11.4	31.0080	12.0	32.6400	1.2	3.2640		
zeta-cypermethrin Fury	I					0.00069	0.0019				
Zolone phosalone	I	0.05	0.1360			0.63	1.7136			0.00075	0.0020
Zorial norflurazon	H	16.3	44.3360			8.1	22.0320				

1 All commercial products are registered (®) by the manufacturers.

2 Pesticide type: H = herbicide; I = insecticide; F = fungicide

References

The toxicity values listed are from sources too numerous to list. Much of the toxicity data given is from the "Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates" by W.W. Johnson and M.T. Finley, 1980, U.S. Department of the Interior, Fish and Wildlife Service, Resource Publication 137, Washington, D.C. The manufacturers of agricultural chemicals also provided much of the toxicity data listed.

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