

SUPPORTING INFORMATION FOR THE PAPER: FUNGICIDES – AN OVERLOOKED PESTICIDE CLASS?

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DETAILS ABOUT LITERATURE REVIEW

The literature search was performed in mid-2017. Note that references of all retrieved articles (including topically related reviews; e.g., Maltby et al.¹) were screened for further relevant articles.

Exposure part.

- Physico-chemical Properties: Pesticide Properties DataBase² was searched for parameters related to mobility and dissipation for fungicides, herbicides, and insecticides as well as for the major fungicide groups.
- Detection in Aquatic Systems: First, all fungicide concentrations were extracted from the field studies (n = 56) reported by Knäbel et al.,³ a comprehensive compilation of fungicide surface water concentrations until 2012. Second, Web of Science was searched using the search string “(fungicid* AND (exposure* OR concentration*) AND (water OR lake OR stream OR river OR aquatic) AND (“field stud*” or monitor*))” in order to retrieve studies with fungicide surface water concentrations for the time span 2012 – 2017. Studies were considered irrelevant if they dealt with inorganic fungicides, long phased out fungicides, or when individual fungicide data was unavailable or not reported. Fungicide classes with less than 10 observations were excluded from Table 1 and Table S1 (1090 observations).

Mitigation part.

- Web of Science was searched using the search string “(pesticid* OR fungicid*) AND (mitigat* OR buffer* OR wetland*) AND (aqua* OR ditch* OR freshwat* OR pond*)”.

Effects part.

- Microorganisms: Web of Science was searched using the search string “fungicid* AND (effect OR ecotox* OR toxic*) AND (water OR lake OR stream OR river OR aquatic) AND (fungi OR fungus OR fungal OR microorganism OR microb* OR bacteri* OR diatom OR algae)”.
- Plants: Web of Science was searched using the strings “fungicid* AND effect AND macrophyte*”, “fungicid* AND effect AND (plant* OR macrophyte*)”, and “fungicid* AND (effect OR ecotox* OR testing)”. Additionally, Web of Science was searched on the compound level, e.g. “azoxystrobin AND (plant* OR macrophyte*)”.
- Invertebrates: Web of Science was searched using the search string “fungicid* AND (water OR lake OR stream OR river OR aquatic OR marin*) AND (invertebrate OR crustacean OR insect OR snail OR worm OR larva* OR bivalv*)”.
- Vertebrates: Web of Science was searched using the string “fungicid* AND (water OR lake OR stream OR river OR aquatic OR marin*) AND (fish* OR reptile* OR turtle* OR

alligator* OR crocodil* OR amphibian* OR frog* OR salamander* OR mammal*)”.

- Effect studies were considered irrelevant if they dealt with inorganic fungicides, long phased-out fungicides, fungicides were applied only in mixture with other chemical pollutants, or when field assessments were not designed to primarily detect fungicide effects.

Risk part.

- Pesticide Properties DataBase² was searched for acute toxicity data for algae, fish, and invertebrates for the 28 fungicides for which ≥ 10 observations were available.

FUNGICIDE DETECTION IN SURFACE WATERS

Table S1. Fungicide concentrations detected in surface waters by continent (N = number of observations on each continent).*

Substance	Fungicide group	Continent	Mean (SD)	Median	Range	References
Azoxystrobin	Strobilurin	Europe (N=29)	2.59 (6.61)	0.400	0.033-29.7	Berenzen et al. 2005 ⁴ , Bereswill et al. 2012 ⁵ , Liess et al. 2005 ⁶ , Magali et al. 2016 ⁷ , Maillard et al. 2012 ⁸ , Neumann et al. 2003 ⁹ , Rabiet et al. 2010 ¹⁰
		North America (N = 98)	0.116 (0.488)	0.024	0.0005-4.55	Battaglin et al. 2011 ¹¹ , Reilly et al. 2012 ¹² , Smalling and Orlando 2011 ¹³ , Smalling et al., 2015 ¹⁴
		South America (N=1)	1.360	NA	NA	Milhome et al. 2015 ¹⁵
Benomyl	Benzimidazole	North America (N=1)	0.011	NA	NA	Phillips and Bode 2004 ¹⁶
Boscalid	Carboxamide	Europe (N=4)	7.29 (9.72)	2.55	0.049-24.0	Bereswill et al. 2012 ⁵ , Papadakis et al. 2015 ¹⁷
		North America (N=101)	0.534 (3.62)	0.028	0.0028-36.0	Reilly et al. 2012 ¹² , Smalling and Orlando 2011 ¹³
Captfol	Caboxamide	Europe (N=1)	0.0106	NA	NA	Vioque-Fernández et al. 2007 ¹⁸
Captan	Phthalimide	Africa (N=6)	0.026 (0.014)	0.030	0.012-0.037	Abbassy et al. 1999 ¹⁹
		Asia (N=6)	0.161 (0.169)	0.087	0.014-0.380	Oh et al. 2007 ²⁰
		Europe (N=3)	0.317 (0.309)	0.260	0.040-0.650	Angelidis et al. 1996 ²¹ , Jimenez et al 1997 ²²
		North America (N=1)	0.218	NA	NA	Smalling et al., 2015 ¹⁴
Carbendazim	Benzimidazole	Africa (N=4)	1.48 (1.02)	1.40	0.600-2.50	Stehle et al. 2016 ²³
		Europe (N=19)	0.652 (1.48)	0.160	0.025-6.50	Rabiet et al. 2010 ¹⁰ , Readman et al. 1997 ²⁴ , Sancho et al. 2004 ²⁵ , Süß et al. 2006 ²⁶
		South America (N=8)	1.36 (1.38)	1.10	0.200-4.50	Palma et al. 2004 ²⁷
Chlorothalonil	Chloronitrile	Asia (N=3)	0.367 (0.289)	0.200	0.200-0.700	Sangchan et al. 2014 ²⁸
		Europe (N=5)	0.039 (0.018)	0.034	0.022-0.070	Lambropoulou et al. 2000 ²⁹
		North America (N=64)	0.046 (0.143)	0.0026	<0.005-1.00	Arnold et al. 2004 ³⁰ , Battaglin et al. 2011 ¹¹ , Castillo et al. 2000 ³¹ , Diepens et al. 2014 ³² , Lehotay et al. 1998 ³³ , LeNoir et al. 1999 ³⁴ , Reilly et al. 2012 ¹² , Scott et al. 2002 ³⁵ , Smalling and Orlando 2011 ¹³ , Smalling et al., 2015 ¹⁴ , Tierney et al. 2008 ³⁶ , Wan et al. 2006 ³⁷
Cyproconazole	Triazole	Europe (N=1)	0.040	NA	NA	Magali et al. 2016 ⁷
Cyprodinil	Anilinopyrimidine	Europe (N=11)	0.865 (0.803)	0.740	0.020-2.40	Bereswill et al. 2012 ⁵ , Süß et al. 2006 ²⁶
		North America (N=4)	0.047 (0.088)	0.004	0.001-0.176	Reilly et al. 2012 ¹²
Dichloran	Chlorophenyl	Europe (N=1)	0.474	NA	NA	Readman et al. 1997 ²⁴
Difenoconazole	Triazole	North America (N=2)	0.55 (0.25)	0.55	0.25-0.80	Diepens et al. 2014 ³²
		South America (N=1)	6.93	NA	NA	Milhome et al. 2015 ¹⁵
Dimethomorph	Morpholine	Africa (N=1)	0.200	NA	NA	Stehle et al. 2016 ²³
		Europe (N=15)	5.92 (9.05)	2.81	0.029-35.0	Bereswill et al. 2012 ⁵ , Lefrancq et al. 2017 ³⁸ , Maillard et al. 2012 ⁸ , Papadakis et al. 2015 ¹⁷ , Rabiet et al. 2010 ¹⁰
Edifenphos	Organophosphate	Asia (N=16)	0.216 (0.458)	0.0205	0.005-1.52	Nagafuchi et al. 1994 ³⁹ , Numabe and Nagahora 2006 ⁴⁰ , Sudo et al. 2004 ⁴¹ , Tanabe et al. 2001 ⁴² , Tsuda et al. 1996 ⁴³
Epoconazole	Triazole	Europe (N=15)	0.896 (1.56)	0.100	0.050-5.60	Berenzen et al. 2005 ⁴ , Liess et al. 2005 ⁶ , Magali et al. 2016 ⁷ , Neumann et al. 2002 ⁴⁴
		North America (N=6)	0.333 (0.216)	0.250	0.100-0.600	Diepens et al. 2014 ³²
		South America (N=2)	0.038 (0.018)	0.038	0.025-0.050	De Gerónimo et al. 2014 ⁴⁵
Fenpropimorph	Morpholine	Europe (N=10)	2.71 (3.79)	1.13	0.20-12.0	Kreuger 1998 ⁴⁶ , Liess et al. 2005 ⁶ , Ludvigsen and Lode 2001 ⁴⁷ , Neumann et al. 2002 ⁴⁴ , Neumann et al. 2003 ⁹ , Turnbull et al. 1997 ⁴⁸
Fluopicolide	Benzamide	Europe (N=1)	8.2	NA	NA	Lefrancq et al. 2017 ³⁸
Fluquinconazole	Triazole	Europe (N=8)	2.11 (2.21)	0.925	0.07-5.60	Süß et al. 2006 ²⁶
Flusilazole	Triazole	Africa (N=4)	0.650 (0.554)	0.40	0.20-1.60	Stehle et al. 2016 ²³
		Europe (N=1)	0.042	NA	NA	Magali et al. 2016 ⁷
Flutolanil	Oxathiin	Asia (N=35)	2.32 (5.63)	0.200	0.009-30.3	Añasco et al. 2010 ⁴⁹ , Nagafuchi et al. 1994 ³⁹ , Oh et al. 2007 ²⁰ , Okamura et al. 1999 ⁵⁰ , Sudo et al. 2004 ⁴¹ , Tanabe and Kawata 2009 ⁵¹ , Tanabe et al. 2000 ⁵² , Tanabe et al. 2001 ⁴² , Tsuda et al. 1996 ⁴³
Flutriafol	Oxathiin	Europe (N=3)	0.034 (0.018)	0.044	0.009-0.05	Long et al. 1998 ⁵³ , Papadakis et al. 2015 ¹⁷
Folpet	Phthalimide	Europe (N=6)	0.640 (0.853)	0.157	0.011-2.3	Bereswill et al. 2012 ⁵ , Lambropoulou et al. 2000 ²⁹ , Vioque-Fernández et al. 2007 ¹⁸
Hexachlorobenzene	Chlorinated hydrocarbon	Africa (18)	0.212 (0.014)	0.208	0.195-0.240	Abbassy et al. 1999 ¹⁹
		Asia (1)	0.070	NA	NA	Singh et al. 2007 ⁵⁴
Iprobenfos	Organophosphate	Europe (10)	0.132 (0.180)	0.029	0.005-0.52	Golfinopoulos et al. 2003 ⁵⁵ , Vryzas et al. 2009 ⁵⁶ , Greve 1972 ⁵⁷
		Asia (N=81)	1.92 (3.92)	0.420	0.010-24.0	Añasco et al. 2010 ⁴⁹ , Iwakuma et al. 1993 ⁵⁸ , Jeon and Yang 1990 ⁵⁹ , Nohara and Iwakuma 1996 ⁶⁰ , Oh et al. 2007 ²⁰ , Shiraishi et al. 1988 ⁶¹ , Tanabe et al. 2000 ⁵² , Tanabe et al. 2001 ⁴² , Tsuda et al. 1993 ⁶² , Tsuda et al. 1996 ⁴³

Table S1 continued.

Substance	Fungicide group	Continent	Mean (SD)	Median	Range	References
Iprodione	Dicarboximide	Europe (N=1)	0.14	NA	NA	Ludvigsen and Lode 2001 ⁴⁷
		North America (N=3)	0.049 (0.053)	0.025	0.007-0.028	Smalling and Orlando 2011 ¹³
Isoprothiolane	Phosphorothiolate	Asia (N=55)	2.18 (3.61)	0.712	0.010-16.8	Iwafune et al. 2010 ⁹³ , Kawata 2009 ⁵¹ , Nagafuchi et al. 1994 ³⁹ , Oh et al. 2007 ²⁰ , Shiraishi et al. 1988 ⁶¹ , Sudo et al. 2002 ⁶⁴ , Sudo et al. 2004 ⁴¹ , Tanabe et al. 2000 ⁵² , Tanabe et al. 2001 ⁴² , Tsuda et al. 2009 ⁶⁵ , Golfinoopoulos et al. 2003 ⁵⁵ , Vryzas et al. 2009 ⁵⁶
Kresoxim-methyl Metalaxyl	Strobilurin	Europe (N=14)	0.849 (1.08)	0.400	0.050-3.00	Numabe and Nagahora 2006 ⁴⁰
	Phenylamide	Asia (N=5)	0.152 (0.062)	0.150	0.080-0.240	Bereswill et al. 2012 ⁵ , Espada et al. 2001 ⁶⁶ , Gandraß et al. 1995 ⁶⁷ , Ludvigsen and Lode 2001 ⁴⁷ , Magali et al. 2016 ⁷ , Maillard et al. 2012 ⁸ , Papadakis et al. 2015 ¹⁷
Metconazole Myclobutanil	Triazole	Europe (N=18)	1.12 (2.15)	0.203	0.020-7.70	Battaglin et al. 2011 ¹¹ , Furtula et al. 2006 ⁶⁸ , Miles and Pfeuffer 1997 ⁶⁹ , Phillips and Bode 2004 ¹⁶ , Smalling et al. 2018 ⁷⁰ , Wan et al. 2006 ³⁷
		North America (N=17)	0.395 (1.33)	0.026	0.002-5.50	De Gerónimo et al. 2014 ⁴⁵
Metconazole Myclobutanil	Triazole	South America (N=2)	0.049 (0.024)	0.049	0.025-0.072	Bereswill et al. 2012 ⁵ , Süß et al. 2006 ²⁶
		Europe (N=7)	1.18 (1.68)	0.310	0.050-4.70	Battaglin et al. 2011 ¹¹ , Phillips and Bode 2004 ¹⁶ , Smalling and Orlando 2011 ¹³
Penconazole Phthalide	Triazole	North America (N=27)	0.342 (0.616)	0.079	0.004-2.65	Battaglin et al. 2011 ¹¹ , Phillips and Bode 2004 ¹⁶ , Smalling and Orlando 2011 ¹³
	Unclassified	Europe (N=10)	0.615 (0.758)	0.315	0.016-2.50	Bereswill et al. 2012 ⁵ , Süß et al. 2006 ²⁶ , Vioque-Fernández et al. 2007 ¹⁸
Probenazole Procymidone	Triazole	Asia (N=26)	0.352 (0.502)	0.165	0.003-1.90	Añasco et al. 2010 ⁴⁹ , Nagafuchi et al. 1994 ³⁹ , Numabe and Nagahora 2006 ⁴⁰ , Tanabe and Kawata 2009 ⁵¹ , Tanabe et al. 2000 ⁵²
	Unclassified	Asia (N=5)	0.218 (0.057)	0.20	0.163-0.30	Tanabe et al. 2001 ⁴² , Tanabe et al. 2000 ⁵²
Propiconazole	Triazole	Africa (N=6)	2.67 (3.93)	0.355	0.050-9.06	Dabrowski et al. 2002 ⁷¹
		Europe (N=9)	0.948 (0.995)	0.689	0.030-3.17	Espada et al. 2001 ⁶⁶ , Griffini et al. 1997 ⁷² , Rabiet et al. 2010 ¹⁰
Propiconazole	Triazole	Europe (N=18)	2.38 (5.03)	0.600	0.007-20.0	Kahle et al. 2008 ⁷³ , Kreuger 1998 ⁴⁶ , Liess et al. 2005 ⁶ , Long et al. 1998 ⁵³ , Ludvigsen and Lode 2001 ⁴⁷ , Neumann et al. 2003 ⁹
		North America (N=19)	2.89 (6.04)	0.171	0.022-24.2	Battaglin et al. 2011 ¹¹ , Milhome et al. 2015 ¹⁵ , Smalling and Orlando 2011 ¹³ , Smalling et al. 2018 ⁷⁰
Pyraclostrobin	Strobilurin	South America (N=1)	10.1	NA	NA	Milhome et al. 2015 ¹⁵
		North America (N=46)	0.267 (1.06)	0.0517	<0.0001-7.11	Battaglin et al. 2011 ¹¹ , Reilly et al. 2012 ¹² , Smalling and Orlando 2011 ¹³ , Smalling et al. 2015 ¹⁴
Pyrimethanil	Anilinoypyrimidine	Africa (N=5)	0.560 (0.358)	0.500	0.200-1.10	Magali et al. 2016 ⁷ , Stehle et al. 2016 ²³
		Europe (N=15)	8.02 (14.1)	1.90	0.051-51.0	Bereswill et al. 2012 ⁵ , Süß et al. 2006 ²⁶
Pyroquilon	Unclassified	North America (N=26)	0.003 (0.007)	0.001	0.0002-0.38	Reilly et al. 2012 ¹² , Smalling et al., 2015 ¹⁴
		Asia (N=21)	1.16 (1.77)	0.530	0.051-7.77	Ebise and Inoue 2002 ⁷⁴ , Nagafuchi et al. 1994 ³⁹ , Numabe and Nagahora 2006 ⁴⁰ , Sudo et al. 2004 ⁴¹ , Tsuda et al. 2009 ⁶⁵
Quintozene	Chlorophenyl	Asia (N=16)	2.21 (3.42)	0.825	0.020-12.0	Fushiwaki et al. 1994 ⁷⁵
		Europe (N=12)	0.149 (0.056)	0.140	0.056-0.229	Papadakis et al. 2015 ¹⁷
Spiroxamine	Morpholine	North America (N=3)	0.100 (0.014)	0.100	0.090-0.110	Tierney et al. 2008 ³⁶ , Wan et al. 2006 ³⁷
		Africa (N=1)	0.50	NA	NA	Stehle et al. 2016 ²³
Tebuconazole	Triazole	Europe (N=2)	0.235 (0.035)	0.235	0.235-0.270	Bereswill et al. 2012 ⁵
		Africa (N=4)	1.70 (1.34)	1.55	0.400-3.30	Stehle et al. 2016 ²³
Tebuconazole	Triazole	Europe (N=34)	3.40 (13.9)	0.143	0.0004-81.0	Berenzen et al. 2005 ⁴ , Kahle et al. 2008 ⁷³ , Lefrancq et al. 2017 ³⁸ , Liess et al. 2005 ⁶ , Magali et al. 2016 ⁷ , Maillard et al. 2012 ⁸ , Rabiet et al. 2010 ¹⁰ , Schäfer et al. 2007 ⁷⁶
		North America (N=2)	0.089 (0.037)	0.089	0.063-0.115	Battaglin et al. 2011 ¹¹ , Smalling et al., 2015 ¹⁴
Tetraconazole	Triazole	South America (N=2)	0.033 (0.004)	0.033	0.030-0.035	De Gerónimo et al. 2014 ⁴⁵
		Europe (N=3)	2.30 (3.17)	0.090	0.020-6.8	Lefrancq et al. 2017 ³⁸ , Magali et al. 2016 ⁷ , Maillard et al. 2012 ⁸
Thiabendazole Triadimenol	Benzimidazole Triazole	North America (N=1)	0.047	NA	NA	Battaglin et al. 2011 ¹¹
		Europe (N=1)	0.22	NA	NA	Ludvigsen and Lode 2001 ⁴⁷
Thiabendazole Triadimenol	Triazole	Europe (N=5)	1.71 (1.11)	0.91	0.18-4.0	Kreuger 1998 ⁴⁶ , Lefrancq et al. 2017 ³⁸ , Süß et al. 2006 ²⁶
		North America (N=1)	0.070	NA	NA	Diepens et al. 2014 ³²
Tricyclazole	Triazolobenzothiazole	Asia (N=7)	1.99 (2.10)	1.70	0.036-5.80	Tanabe and Kawata 2009 ⁵¹ , Tanabe et al. 2000 ⁵² , Tanabe et al. 2001 ⁴²
		Europe (N=20)	2.80 (4.83)	0.745	0.050-15.6	Padovani et al. 2006 ⁷⁷
Trifloxystrobin	Strobilurin	Europe (N=2)	2.47 (1.63)	2.47	0.83-4.1	Bereswill et al. 2012 ⁵
		North America (N=1)	0.029	NA	NA	Battaglin et al. 2011 ¹¹
Zoxamide	Benzamide	Africa (N=10)	0.33 (0.257)	0.250	0.10-0.90	Stehle et al. 2016 ²³

*Fungicide classes that were observed as part of the literature review but were not included due to their limited observations (less than 10): Acylamino acid (benalaxyl), aromatic hydrocarbons (etridiazole), benzanilide (mepromil), dithiocarbamate (iprodione, thiram), cyanoacetamide oxime (cyromoxanil), cyanoimidazole (cyazofamid), imidazole (imazalil, prochloraz), organochlorine (pentachlorophenol), oxazole (famoxadone), phenylpyridinamine (fluazinam), phenylpyrrole (fludioxinil), phenylurea (pencycuron), quinoline (quinoxifen), substituted benzene (chloroneb), sulphamide (dichlorfluand).

LOWEST EFFECT CONCENTRATIONS

Table S2. Lowest effect concentrations for fungicide groups identified in the peer-reviewed literature.

Fungicide group	Organism group	Substance	Concentration (µg/L)	Reference
DMIs	Microbes	Clotrimazole	0.0172	Porsbring et al. 2009 ⁷⁸
	Plants	Climbazole	13	Richter et al. 2013 ⁷⁹
	Invertebrates	Clotrimazole	0.14	Gonzalez-Ortegon et al. 2013 ⁸⁰
	Vertebrates	Tebuconazole	5	Bernabò et al. 2016 ⁸¹
Strobilurins	Microbes	Azoxystrobin	0.004	Dijksterhuis et al. 2011 ⁸²
	Plants	Azoxystrobin	3.3	van Wijngaarden et al. 2014 ⁸³
	Invertebrates	Azoxystrobin	0.026	Warming et al. 2009 ⁸⁴
	Vertebrates	Pyraclostrobin	5	Hooser et al. 2012 ⁸⁵
Benzimidazoles	Microbes	Carbendazim	35	Zubrod et al. 2015 ⁸⁶
	Plants		nd	
	Invertebrates	Carbendazim	5	Silva et al. 2015 ⁸⁷
	Vertebrates	Carbendazim	1648	Rico et al. 2011 ⁸⁸
Chloronitriles	Microbes	Chlorothalonil	0.0176	McMahon et al. 2013 ⁸⁹
	Plants	Chlorothalonil	94	Belgers et al. 2009 ⁹⁰
	Invertebrates	Chlorothalonil	0.5	Bellas 2006 ⁹¹
	Vertebrates	Chlorothalonil	0.0164	McMahon et al. 2011 ⁹²
Dithiocarbamates	Microbes	Mancozeb	0.57	Rohr et al. 2017 ⁹³
	Plants		na	
	Invertebrates	Mancozeb	3.3	Mo et al. 2016 ⁹⁴
	Vertebrates	Maneb	50	Gürkan and Hayretdağ 2015 ⁹⁵

nd = not detected; na = not available

FUNGICIDE RACs

Table S3. Regulatory acceptable concentrations (RACs) as compiled by Zubrod et al.⁸⁶ RACs were obtained from the respective “conclusion on pesticide review” by the European Food Safety Authority (EFSA) or – if the former was not available – the review report by the European Commission’s Directorate General for Health & Consumers. Only RACs that could be identified unequivocally were included.

Fungicide group	Substance	RAC
DMIs	Bromuconazole	2
	Cyproconazole	2.3
	Difenoconazole	0.56
	Epoxiconazole	0.43
	Fenbuconazole	0.6
	Fluquinconazole	1.4
	Flutriafol	1.3
	Imazalil (aka enilconazole)	8.85
	Metconazole	0.291
	Myclobutanil	2.4
	Penconazole	3.2
	Prochloraz	0.55
	Propiconazole	5.01
	Prothioconazole	56
	Tebuconazole	1
	Tetraconazole	4.2
	Triadimenol	10
Triflumizole	4.4	
Triticonazole	1	
Strobilurins	Azoxystrobin	3.3
	Dimoxystrobin	1
	Famoxadone	0.12
	Fenamidone	0.53
	Fluoxastrobin	0.061
	Kresoxim-methyl	11
	Pyraclostrobin	0.06
Benzimidazoles	Trifloxystrobin	0.11
	Carbendazim	0.15
	Fuberidazole	9.1
	Thiabendazole	4.2
Chloronitriles	Chlorothalonil	3.3
Dithiocarbamates	Dazomet	0.4
	Metam	0.531
	Metiram	0.43
	Propineb	2.6

FUNGICIDE RISK QUOTIENTS

Table S4. Risk quotients (ratio of maximum detected field concentrations [Table S1; substances with ≥10 observations] and toxicity data provided by the Pesticide Properties DataBase²) for algae, fish, and invertebrates separated by continent and global. Risk quotients >0.01 (underlined) and >0.1 (double underlined) indicate moderate and high risks, respectively. Italics indicate an unclear risk (i.e., toxicity value provided as “greater than” value).

Substance	Africa			Asia			Europe			North America			South America			Global		
	Algae	Fish	Inv.	Algae	Fish	Inv.	Algae	Fish	Inv.	Algae	Fish	Inv.	Algae	Fish	Inv.	Algae	Fish	Inv.
Azoxystrobin	NA	NA	NA	NA	NA	NA	<u>0.08250</u>	<u>0.06319</u>	<u>0.12913</u>	<u>0.01264</u>	0.00968	<u>0.01978</u>	0.00378	0.00289	0.00591	<u>0.08250</u>	<u>0.06319</u>	<u>0.12913</u>
Boscalid	NA	NA	NA	NA	NA	NA	0.00640	0.00889	0.00450	0.00960	<u>0.01333</u>	0.00675	NA	NA	NA	0.00960	<u>0.01333</u>	0.00675
Captan	0.00003	0.00020	0.00001	0.00032	0.00204	0.00005	0.00055	0.00349	0.00009	0.00018	0.00117	0.00003	NA	NA	NA	0.00055	0.00349	0.00009
Carbendazim	<0.00032	<u>0.01316</u>	<u>0.01667</u>	NA	NA	NA	<0.00084	<u>0.03421</u>	<u>0.04333</u>	NA	NA	NA	<0.00058	<u>0.02368</u>	<u>0.03000</u>	<0.00032	<u>0.03421</u>	<u>0.04333</u>
Chlorothalonil	NA	NA	NA	0.00333	<u>0.04118</u>	<u>0.01296</u>	0.00033	0.00412	0.00130	0.00476	<u>0.05882</u>	<u>0.01852</u>	NA	NA	NA	0.00476	<u>0.05882</u>	<u>0.01852</u>
Cyprodinil	NA	NA	NA	NA	NA	NA	0.00092	0.00100	<u>0.01091</u>	0.00007	0.00007	0.00080	NA	NA	NA	0.00092	0.00100	<u>0.01091</u>
Dimethomorph	0.00001	0.00006	<0.00002	NA	NA	NA	<i>0.00120</i>	<u>0.01029</u>	<0.00330	NA	NA	NA	NA	NA	NA	0.00120	<u>0.01029</u>	<0.00330
Edifenphos	NA	NA	NA	NA	0.00353	<u>47.50000</u>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00353	<u>47.50000</u>
Epoxiconazole	NA	NA	NA	NA	NA	NA	0.00471	0.00178	0.00064	0.00050	0.00019	0.00007	0.00004	0.00002	0.00001	0.00471	0.00178	0.00064
Fenpropimorph	NA	NA	NA	NA	NA	NA	<u>0.03670</u>	0.00522	0.00536	NA	NA	NA	NA	NA	NA	<u>0.03670</u>	0.00522	0.00536
Flutolanil	NA	NA	NA	<u>0.03124</u>	0.00561	<0.00446	NA	NA	NA	NA	NA	NA	NA	NA	NA	<u>0.03124</u>	0.00561	<0.00446
Hexachloro-benzene	<u>0.02400</u>	0.00800	0.00048	0.00700	0.00233	0.00014	<u>0.05200</u>	<u>0.01733</u>	0.00104	NA	NA	NA	NA	NA	NA	<u>0.05200</u>	<u>0.01733</u>	0.00104
Iprobenfos	NA	NA	NA	0.00397	0.00163	<0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00397	0.00163	<0.02
Isoprothiolane	NA	NA	NA	0.00367	0.00247	0.00027	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00367	0.00247	0.00027
Kresoxim-methyl	NA	NA	NA	NA	NA	NA	<u>0.04762</u>	<u>0.01579</u>	<u>0.01613</u>	NA	NA	NA	NA	NA	NA	<u>0.04762</u>	<u>0.01579</u>	<u>0.01613</u>
Metalaxyl	NA	NA	NA	0.00057	0.00025	0.00007	<u>0.01833</u>	0.00802	0.00222	<u>0.01310</u>	0.00573	0.00159	NA	NA	NA	<u>0.01833</u>	0.00802	0.00222
Myclobutanil	NA	NA	NA	NA	NA	NA	0.00177	0.00235	0.00028	0.00100	0.00133	0.00016	NA	NA	NA	0.00177	0.00235	0.00028
Penconazole	NA	NA	NA	NA	NA	NA	0.00051	0.00221	0.00037	NA	NA	NA	NA	NA	NA	0.00051	0.00221	0.00037
Phthalide	NA	NA	NA	0.000001	5.94E-06	0.00005	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.000001	5.94E-06	0.00005
Procymidone	0.00348	0.00125	<0.00503	NA	NA	NA	0.00122	0.00044	<0.00176	NA	NA	NA	NA	NA	NA	0.00348	0.00125	<0.00503
Propiconazole	NA	NA	NA	NA	NA	NA	<u>0.21505</u>	0.00769	0.00196	<u>0.26022</u>	0.00931	0.00237	<u>0.10860</u>	0.00388	0.001	<u>0.26022</u>	0.00931	0.00237
Pyraclostrobin	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00843	<u>1.18500</u>	<u>0.44438</u>	NA	NA	NA	<0.00843	<u>1.18500</u>	<u>0.44438</u>
Pyrimethanil	0.00092	0.00010	0.00038	NA	NA	NA	<u>0.04250</u>	0.00483	<u>0.01759</u>	0.00032	0.00004	0.00013	NA	NA	NA	<u>0.04250</u>	0.00483	<u>0.01759</u>
Pyroquilon	NA	NA	NA	NA	0.00060	0.00013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00060	0.00013
Quintozene	NA	NA	NA	NA	<u>0.12000</u>	<u>0.01558</u>	NA	0.00229	0.00030	NA	0.00110	0.00014	NA	NA	NA	NA	<u>0.12000</u>	<u>0.01558</u>
Tebuconazole	0.00168	0.00075	0.00118	NA	NA	NA	<u>0.04133</u>	<u>0.01841</u>	<u>0.02903</u>	0.00006	0.00003	0.00004	0.00002	0.00001	0.00001	<u>0.04133</u>	<u>0.01841</u>	<u>0.02903</u>
Tricyclazole	NA	NA	NA	0.00071	0.00079	0.00017	0.00190	0.00214	0.00046	NA	NA	NA	NA	NA	NA	0.00190	0.00214	0.00046
Zoxamide	<0.00115	0.00563	<u>0.08182</u>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00115	0.00563	<u>0.08182</u>

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