

Supplementary Information

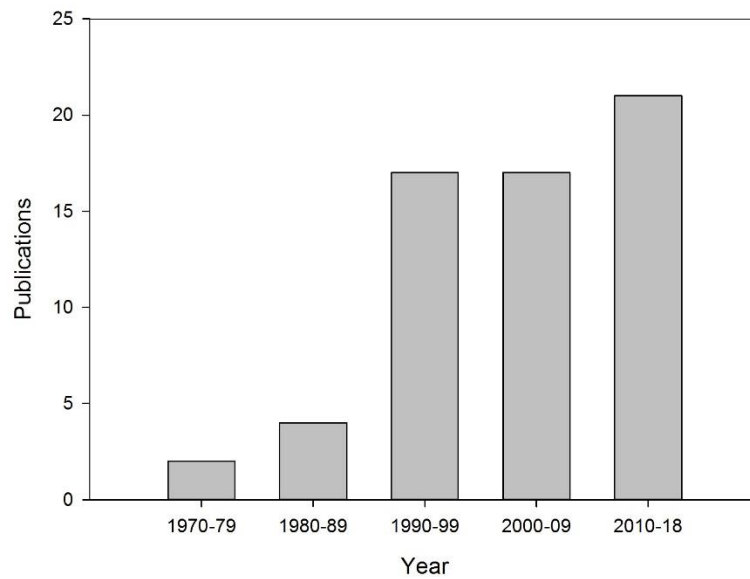


Figure S1. Number of publications with time used in our meta-analysis.

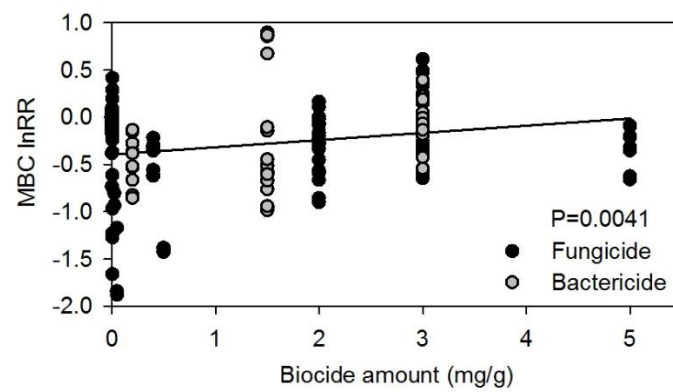


Figure S2. The response ratio of MBC in relation to biocide amount.

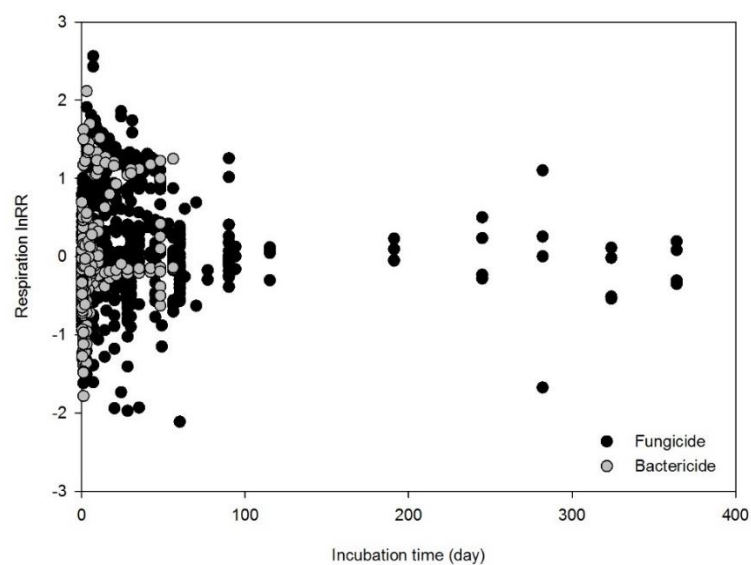


Figure S3. The response ratio of soil respiration in relation to incubation time.

Table S1. Selected keywords for this meta-analysis.

No.	Keywords
1	"microbial biomass"
2	biocide
3	"biomass carbon"
4	fungi and bacteria
5	"carbon cycle"
6	"nitrogen cycle"
7	"microbial carbon"
8	fungicide
9	bactericide
10	antibiotics
11	"microbial nitrogen"
12	"microbial respiration"
13	"fungicide and bactericide"
14	"soil respir*"
15	"nitrogen minerali*"
16	"nitrous oxide"
17	nitrificat*
18	denitrificat*

Table S2. Country-wise application of different biocides.

Biocide name	Country & no. of publication																		Total publications
	China	Canada	USA	UK	India	Italy	Ireland	Japan	Poland	Germany	New Mexico	Luxembourg	Scotland	Russia	Spain	Australia	France	Denmark	
Azoxystrobin (F)	1		1																2
Benomyl (F)			5																5
Boscalid (F)	1																		1
Captan (F)	1		8	3	1				1	1									15
Carbendazim (F)	2				1														3
Chlorothalonil (F)	3		4																7
Cu oxychloride (F)					1														1
Cu ammonium acetate (F)																1			1
Cycloheximide (F)	1	1	6			2	1	1			1	1	3	1					18
Cyprodinil (F)						1													1
Dexon (F)					1														1
Difenoconazole (F)															2				2
Epoxiconazole (F)				1															1
Hexaconazole (F)	1																		1
Impact Super (F)									1										1
Iprodione (F)	1																		1
Lime-sulfur (F)			1																1
Mancozeb (F)			3		1												1		5
Maneb (F)			1																1
Mefenoxam (F)										1									1
Metalaxyl (F)										1									1
Mirage (F)									1										1
Nitrapyrin (F)			1																1
Penconazole (F)						1													1

Biocide name	Country & no. of publication																		Total publications
	China	Canada	USA	UK	India	Italy	Ireland	Japan	Poland	Germany	New Mexico	Luxembourg	Scotland	Russia	Spain	Australia	France	Denmark	
Pentachlorophenol (F)						1													1
Propiconazole (F)																		1	1
Pyraclostrobin (F)			1																1
Pyrimorph (F)	1																		1
Tebuconazole (F)	1														1				2
Terrazole (F)			2																2
Tridemorph (F)					1														1
Triadimefon (F)				1															1
Thiram (F)			1	1															2
Verdasan (F)				1															1
Vinclozolin (F)														1					1
Bronopol (B)	1		1	2															4
Oxytetracycline (B)			2						1										3
Streptomycin (B)	1	1	5			2	1	1			1	1	1						14
Captan+Bronopol (F+B)				1															1
Captan+Oxytetracycline (F+B)			1																1
Cycloheximide+Streptomycin (F+B)	1	1	3			2													7

Note: F = fungicide, B = bactericide, F+B = fungicide+bactericide

Table S3. Chemical structure of studied biocides.

No.	Biocide name	Biocide type	Molecular formula	Total atomic mass	CAS Registry Number	N%	C/N
1	Azoxystrobin	Fungicide	C ₂₂ H ₁₇ N ₃ O ₅	403	131860-33-8	10.4	6
2	Benomyl	Fungicide	C ₁₄ H ₁₈ N ₄ O ₃	290	17804-35-2	19.3	3
3	Boscalid	Fungicide	C ₁₈ H ₁₂ Cl ₂ N ₂ O	343	188425-85-6	8.2	8
4	Captan	Fungicide	C ₉ H ₈ Cl ₃ NO ₂ S	300	133-06-2	4.7	8
5	Carbendazim	Fungicide	C ₉ H ₉ N ₃ O ₂	191	10605-21-7	22.0	3
6	Chlorothalonil	Fungicide	C ₈ Cl ₄ N ₂	266	1897-45-6	10.5	3
7	Cu Oxychloride	Fungicide	Cl ₂ Cu ₂ H ₃ O ₃ ⁻	249	1332-40-7	0	n/a
8	Cu ammonium acetate	Fungicide	C ₄ H ₁₀ CuNO ₄	200	43043-77-2	7.0	3
9	Cycloheximide	Fungicide	C ₁₅ H ₂₃ NO ₄	281	66-81-9	5.0	13
10	Cyprodinil	Fungicide	C ₁₄ H ₁₅ N ₃	225	121552-61-2	18.7	4
11	Dexon	Fungicide	C ₈ H ₁₀ N ₃ NaO ₃ S	251	140-56-7	16.7	2
12	Difenoconazole	Fungicide	C ₁₉ H ₁₇ Cl ₂ N ₃ O ₃	406	119446-68-3	10.4	5
13	Epoxiconazole	Fungicide	C ₁₇ H ₁₃ ClFN ₃ O	329	133855-98-8	12.8	5
14	Hexaconazole	Fungicide	C ₁₄ H ₁₇ Cl ₂ N ₃ O	316	79983-71-4	13.3	4
15	Impact Super	Fungicide	C ₁₆ H ₁₃ F ₂ N ₃ O (flutriafol)+ C ₈ Cl ₄ N ₂ (chlorthalonil)	447	76674-21-0 1897-45-6	15.7	4
16	Iprodione	Fungicide	C ₁₃ H ₁₃ Cl ₂ N ₃ O ₃	336	36734-19-7	12.5	4
17	Lime-sulfur	Fungicide	CaS _x (X=2-7)	104-265	1344-81-6	0	n/a
18	Mancozeb	Fungicide	C ₄ H ₆ N ₂ S ₄ Mn	265	8018-01-7	10.6	2
19	Maneb	Fungicide	(C ₄ H ₆ MnN ₂ S ₄) _n	265	12427-38-2	10.6	2
20	Metalaxyl	Fungicide	C ₁₅ H ₂₁ NO ₄	279	57837-19-1	5.0	13
21	Mefenoxam	Fungicide	C ₁₅ H ₂₁ NO ₄	279	70630-17-0	5.0	13
22	Mirage	Fungicide	C ₁₅ H ₁₆ Cl ₃ N ₃ O ₂	376	67747-09-5	11.2	4
23	Nitrapyrin	Fungicide	C ₆ H ₃ Cl ₄ N	231	1929-82-4	6.1	5
24	Penconazole	Fungicide	C ₁₃ H ₁₅ Cl ₂ N ₃	284	66246-88-6	14.8	4
25	Pentachlorophenol	Fungicide	C ₆ HCl ₅ O	266	87-86-5	0	n/a

No.	Biocide name	Biocide type	Molecular formula	Total atomic mass	CAS Registry Number	N%	C/N
26	Propiconazole	Fungicide	$C_{15}H_{17}Cl_2N_3O_2$	342	60207-90-1	12.3	4
27	Pyraclostrobin	Fungicide	$C_{19}H_{18}ClN_3O_4$	387	175013-18-0	10.8	5
28	Pyrimorph	Fungicide	$C_{22}H_{25}ClN_2O_2$	384	868390-90-3	7.3	9
29	Tebuconazole	Fungicide	$C_{16}H_{22}ClN_3O$	307	107534-96-3	13.7	5
30	Terrazole	Fungicide	$C_5H_5Cl_3N_2OS$	247	2593-15-9	11.3	2
31	Tridemorph	Fungicide	$C_{19}H_{39}NO$	297	24602-86-6	4.7	16
32	Triadimefon	Fungicide	$C_{14}H_{16}ClN_3O_2$	293	43121-43-3	14.3	4
33	Thiram	Fungicide	$C_6H_{12}N_2S_4$	240	137-26-8	11.7	3
34	Verdasan	Fungicide	$C_8H_8HgO_2$	337	62-38-4	0	n/a
35	Vinclozolin	Fungicide	$C_{12}H_9Cl_2NO_3$	286	50471-44-8	4.9	10
36	Bronopol	Bactericide	$C_3H_6BrNO_4$	200	52-51-7	7.0	3
37	Oxytetracycline	Bactericide	$C_{22}H_{24}N_2O_9$	460	79-57-2	6.1	9
38	Streptomycin	Bactericide	$C_{21}H_{39}N_7O_{12}$	581	57-92-1	16.9	3

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