

Supplementary Information

Research Trends of Microplastic in the Soil Environment: Comprehensive Screening of Effects

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Reference list

Table S1. List of previous papers on microplastic research. All papers were collected from online literature systems including Google scholar, ScienceDirect, and Wiley Online Library. “soil plastic”, “soil microplastic”, and “microplastic” with species name of each soil biota (plant, earthworm, springtail etc.) used as search term, and papers published until November 30, 2019 were selected.

Ref. (No.)	Year	Author	Classification	Target organism
1	2012	Rillig	Perspectives and reviews	-
2	2016	Huerta Lwanga et al.	Soil biota	Invertebrate <i>Lumbricus terrestris</i>
3	2016	Nizzetto et al	Perspectives and reviews	-
4	2017	Cao et al.	Soil biota	Invertebrate <i>Eisenia foetida</i>
5	2017	Hodson et al.	Soil biota	Invertebrate <i>Lumbricus terrestris</i>
6	2017	Horton et al.	Perspectives and reviews	-
7	2017	Huerta Lwanga et al.	Monitoring	-
8	2017	Huerta Lwanga et al.	Soil biota	Invertebrate <i>Lumbricus terrestris</i>
9	2017	Liu et al.	Soil properties	-
9	2017	Liu et al.	Soil biota	Microorganism & enzyme
10	2017	Maaß et al.	Soil biota	Invertebrate <i>Folsomia candida</i> <i>Proisotoma minuta</i>
11	2017	Rillig et al.	Perspectives and reviews	-
12	2017	Rillig et al.	Soil biota	Invertebrate <i>Lumbricus terrestris</i>
13	2017	Rodríguez-Seijo et al.	Soil biota	Invertebrate <i>Eisenia andrei</i>
14	2017	Zhao et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
15	2018	Awet et al.	Soil biota	Microorganism & enzyme
16	2018	Bläsing and Amelung	Perspectives and reviews	-
17	2018	Chae and An	Perspectives and reviews	-
18	2018	de Souza Machado et al.	Perspectives and reviews	-
19	2018	de Souza Machado et al.	Soil properties	-
20	2018	Dong et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
21	2018	He et al.	Perspectives and reviews	-
22	2018	Hurley and Nizzetto	Perspectives and reviews	-
23	2018	Kokalj et al	Soil biota	Invertebrate <i>Porcellio scaber</i>
24	2018	Lei et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
25	2018	Lei et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
26	2018	Liu et al.	Monitoring	-
27	2018	Ng et al.	Perspectives and reviews	-
28	2018	Qi et al.	Soil biota	Plant <i>Triticum aestivum</i>
29	2018	Qu et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
30	2018	Rillig	Perspectives and reviews	-
31	2018	Rillig and Bonkowski	Perspectives and reviews	-
32	2018	Rillig et al.	Perspectives and reviews	-
33	2018	Rodríguez-Seijo et al.	Soil biota	Invertebrate <i>Eisenia fetida</i>
34	2018	Scheurer and Bigalke	Monitoring	-
35	2018	Weithmann et al.	Monitoring	-
36	2018	Yang et al.	Soil biota	Microorganism & enzyme
37	2018	Zhang and Liu	Monitoring	-
38	2018	Zhang et al.	Soil biota	Invertebrate <i>Lumbricus terrestris</i>
39	2018	Zhou et al.	Monitoring	-
40	2018	Zhu et al.	Soil biota	Invertebrate <i>Enchytraeus crypticus</i>
41	2018	Zhu et al.	Soil biota	Invertebrate <i>Folsomia candida</i>
42	2018	Zhu et al.	Soil biota	Invertebrate <i>Folsomia candida</i> <i>Hypoaspis aculeifer</i> <i>Damaeus exspinosus</i>
43	2019	Acosta-Coley et al.	Soil biota	Invertebrate <i>Caenorhabditis elegans</i>
44	2019	Bigalke and Filella	Perspectives and reviews	-
45	2019	Bosker et al.	Soil biota	Plant <i>Lepidium sativum L.</i>

Table S1 (continued).

Ref. (No.)	Year	Author	Classification	Target organism
46	2019	Corradini et al.	Monitoring	-
47	2019	Prata et al.	Perspectives and reviews	-
48	2019	de Souza Machado et al.	Soil properties	-
48	2019	de Souza Machado et al.	Soil biota	Microorganism & enzyme
48	2019	de Souza Machado et al.	Soil biota	Plant
49	2019	Fueser et al.	Soil biota	Invertebrate
50	2019	Gao et al.	Soil biota	Plant
51	2019	Huang et al.	Soil biota	Microorganism & enzyme
52	2019	Jiang et al.	Soil biota	Plant
53	2019	Ju et al.	Soil biota	Invertebrate
54	2019	Judy et al.	Soil biota	Plant
55	2019	Kim et al.	Soil biota	Invertebrate
56	2019	Kim et al.	Soil biota	Invertebrate
57	2019	Kim et al.	Soil biota	Plant
				<i>Allium fistulosum</i>
				<i>Caenorhabditis elegans</i>
				<i>Lactuca sativa</i> L.
				-
				<i>Vicia faba</i>
				<i>Fosomia candia</i>
				<i>Triticum aestivum</i>
				<i>Caenorhabditis elegans</i>
				<i>Lobelia sokamensis</i>
				<i>Phaseolus radiates</i>
				<i>Lactuca sativa</i>
				<i>Oryza sativa</i>
58	2019	Lehmann et al.	Soil properties	-
59	2019	Liang et al.	Soil properties	-
59	2019	Liang et al.	Soil biota	Microorganism & enzyme
60	2019	O'Connor et al.	Monitoring	-
61	2019	Panbianco et al.	Monitoring	-
62	2019	Prendergast-Miller et al.	Soil biota	Invertebrate
63	2019	Qu et al.	Soil biota	Invertebrate
64	2019	Qu et al.	Soil biota	Invertebrate
65	2019	Qu et al.	Soil biota	Invertebrate
66	2019	Qu et al.	Soil biota	Invertebrate
67	2019	Qu et al.	Soil biota	Invertebrate
68	2019	Rillig	Perspectives and reviews	-
69	2019	Rodriguez-Sejjo et al.	Soil biota	Invertebrate
70	2019	Sander	Perspectives and reviews	-
71	2019	Song et al.	Soil biota	Invertebrate
72	2019	Wan et al.	Soil properties	-
73	2019	Wang et al.	Soil biota	Invertebrate
74	2019	Wang et al.	Soil biota	Invertebrate
75	2019	Xu et al.	Perspectives and reviews	-
76	2019	Yang et al.	Soil biota	Invertebrate
77	2019	Yu et al.	Soil biota	Invertebrate
78	2019	Zhang et al.	Soil properties	-
79	2019	Zhang et al.	Soil biota	Plant
80	2019	Zhou et al.	Monitoring	-
81	2019	Zhu et al.	Monitoring	-
82	2019	Zhu et al.	Perspectives and reviews	-
				<i>Lumbricus terrestris</i>
				<i>Caenorhabditis elegans</i>
				<i>Caenorhabditis elegans</i>
				<i>Caenorhabditis elegans</i>
				<i>Caenorhabditis elegans</i>
				<i>Caenorhabditis elegans</i>
				<i>Eisenia fetida</i>
				-
				<i>Achatina fulica</i>
				-
				<i>Eisenia fetida</i>
				<i>Metaphire californica</i>
				-
				<i>Lumbricus terrestris</i>
				<i>Lumbricus terrestris</i>
				-
				<i>Murraya exotica</i>

Table S2. List of statistically supported effects reported in papers of microplastic research. A total of 106 data points was extracted from all papers, and 47 data points were screened through acute/chronic and biotic endpoint criterion. There are 9 compositions of microplastic (high-density polyethylene, HDPE; low-density polyethylene, LDPE; polyamide, PA1; polyacrylic, PA2; polyethylene, PE; polyethylene terephthalate, PET; polyester, PES; polypropylene, PP; polystyrene, PS; polyvinyl chloride, PVC) and 5 shapes including bead (or sphere), fiber, film, fragment, and pellet (or particles/powder). The asterisks (*) indicate available data for species sensitivity distribution (SSD)-like analysis.

Microplastic						Target response variable		Test condition		Significant differences			Ref. (No.)
Composition	Shape	Width (diameter) mm	Length	Others	Final value	Classification	Response variable	Test duration	Biotic endpoints	Trends	Concentration (%)	NOEC (%)	
*HDPE	Fragment	0.643	-	-	0.643	Microbial & enzymes	Microbial activity	45	-	Increasing	2	-	48
*HDPE	Fragment	0.643	-	-	0.643	Soil properties	Bulk density	45	-	Decreasing	2	-	48
*HDPE	Fragment	0.643	-	-	0.643	Soil properties	Water availability	45	-	Increasing	2	-	48
*LDPE	Film	0.25-1	-	-	0.625	Plant	<i>Triticum aestivum</i>	61	Root biomass	Decreasing	1	-	29
*LDPE	Film	2	-	-	2	Microbial & enzymes	Catalase	90	-	Increasing	0.0076	-	51
*LDPE	Film	2	-	-	2	Microbial & enzymes	Urease	90	-	Increasing	0.0076	-	51
*LDPE	Film	6.1	6.92	-	6.1	Plant	<i>Triticum aestivum</i>	61	Root biomass	Decreasing	1	-	28
*LDPE	Film	6.1	6.92	-	6.1	Plant	<i>Triticum aestivum</i>	139	Root biomass	Decreasing	1	-	28
*LDPE	Fragment	<0.150	-	-	0.075	Earthworm	<i>Lumbricus terrestris</i>	60	Survival	Decreasing	0.4	0.2	2
*LDPE	Fragment	<0.150	-	-	0.075	Earthworm	<i>Lumbricus terrestris</i>	60	Growth	Decreasing	0.4	0.2	2
LDPE	Pellet	0.25-1	-	-	0.625	Earthworm	<i>Eisenia fetida</i>	28	Catalase	Decreasing	0.0125	0.00625	33
LDPE	Pellet	0.25-1	-	-	0.625	Earthworm	<i>Eisenia fetida</i>	28	Glutathione S-transferase	Increasing	0.1	0.05	33
LDPE	Pellet	0.25-1	-	-	0.625	Earthworm	<i>Eisenia fetida</i>	28	Thiobarbituric acid reactive substances	Increasing	0.025	0.0125	33
LDPE	Pellet	0.25-1	-	-	0.625	Earthworm	<i>Eisenia fetida</i>	28	Lactate dehydrogenase	Increasing	0.1	-	33
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	Root-leave ratio	Decreasing	2	-	48
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	Root tissue density	Decreasing	2	-	48
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	non-arbuscular mycorrhizal fungi hyphae	Decreasing	2	-	48
*PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	Onion bulbs dry biomass	Decreasing	2	-	48
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	Onion bulbs water content	Increasing	2	-	48
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	Leaf nitrogen content	Increasing	2	-	48
PA1	Bead	0.015-0.020	-	-	0.0175	Plant	<i>Allium fistulosum</i>	45	C-N ratio	Decreasing	2	-	48
*PA1	Bead	0.015-0.020	-	-	0.0175	Soil properties	Water stable aggregates	45	-	Decreasing	2	-	48
*PA1	Bead	0.015-0.020	-	-	0.0175	Soil properties	Evapotranspiration	45	-	Increasing	2	-	48
*PA1	Bead	0.015-0.020	-	-	0.0175	Soil properties	Water availability	45	-	Increasing	2	-	48
*PA1	Bead	0.015-0.020	-	-	0.075	Microbial & enzymes	Microbial activity	45	-	Increasing	2	-	48
*PA2	Fiber	0.026	0.37-3.14	-	1.755	Microbial & enzymes	Fluorescein diacetate hydrolisis	42	-	Increasing	0.4	-	59
PE	Bead	0.029	-	-	0.029	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.1	-	56
PE	Bead	0.248	-	-	0.248	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.1	-	56
PE	Bead	<0.5	-	-	0.25	Springtail	<i>Fosomia candia</i>	7	Avoidance	Increasing	0.5	-	53
*PE	Bead	<0.5	-	-	0.25	Springtail	<i>Fosomia candia</i>	28	Survival	Decreasing	1	0.5	53
*PE	Bead	<0.5	-	-	0.25	Springtail	<i>Fosomia candia</i>	28	Reproduction	Decreasing	0.1	0.02	53
PE	Bead	<0.5	-	-	0.25	Springtail	<i>Fosomia candia</i>	28	Gut microbe diversity	Decreasing	0.5	-	53

Table S2 (continued)

Microplastic						Target response variable		Test condition		Significant differences			Ref. (No.)
Composition	Shape	Width (diameter) mm	Length	Others	Final value	Classification	Response variable	Test duration	Biotic endpoint	Trends	Concentration (%)	NOEC (%)	
PE	Film	2	-	-	2	Soil properties	Evaporation rate	<2	-	Increasing	0.5	-	72
PE	Film	2	-	-	2	Soil properties	Shrinkage ratio	<2	-	Increasing	0.5	-	72
PE	Film	2	-	-	2	Soil properties	Evaporation rate	<2	-	Increasing	1	0.5	72
PE	Film	2	-	-	2	Soil properties	Shrinkage ratio	<2	-	Increasing	1	0.5	72
PE	Film	5	-	-	5	Soil properties	Evaporation rate	<2	-	Increasing	0.5	-	72
PE	Film	5	-	-	5	Soil properties	Number of cracks	<2	-	Increasing	0.5	-	72
PE	Film	5	-	-	5	Soil properties	Total crack length	<2	-	Increasing	0.5	-	72
PE	Film	5	-	-	5	Soil properties	Evaporation rate	<2	-	Increasing	1	0.5	72
PE	Film	5	-	-	5	Soil properties	Number of cracks	<2	-	Increasing	1	0.5	72
PE	Film	5	-	-	5	Soil properties	Total crack length	<2	-	Increasing	1	0.5	72
PE	Film	10	-	-	10	Soil properties	Evaporation rate	<2	-	Increasing	0.5	-	72
PE	Film	10	-	-	10	Soil properties	Number of cracks	<2	-	Increasing	0.5	-	72
PE	Film	10	-	-	10	Soil properties	Total crack length	<2	-	Increasing	0.5	-	72
PE	Film	10	-	-	10	Soil properties	Evaporation rate	<2	-	Increasing	1	0.5	72
PE	Film	10	-	-	10	Soil properties	Number of cracks	<2	-	Increasing	1	0.5	72
PE	Film	10	-	-	10	Soil properties	Total crack length	<2	-	Increasing	1	0.5	72
PE	Particle	<0.3	-	-	0.15	Earthworm	<i>Eisenia fetida</i>	14	Superoxide dismutase	Decreasing	20	10	73
PE	Particle	<0.3	-	-	0.15	Earthworm	<i>Eisenia fetida</i>	14	Peroxidase	Increasing	1	-	73
PE	Particle	<0.3	-	-	0.15	Earthworm	<i>Eisenia fetida</i>	14	Catalase	Increasing	20	10	73
PE	Particle	<0.3	-	-	0.15	Earthworm	<i>Eisenia fetida</i>	14	Glutathione S-transferase	Decreasing	20	10	73
PE	Pellet	0.25-1	-	-	0.625	Earthworm	<i>Eisenia andrei</i>	28	Histological changes	Increasing	0.0125	0.00625	13
PES	Fiber	0.0407	0.3616	-	0.3616	Earthworm	<i>Lumbricus terrestris</i>	35	stress gene expression (<i>mt-2</i>)	Increasing	0.1	-	62
PES	Fiber	0.0407	0.3616	-	0.3616	Earthworm	<i>Lumbricus terrestris</i>	35	stress gene expression (<i>hsp70</i>)	Decreasing	1	0.1	62
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Volume of pores (>30 µm)	365	-	Increasing	0.3	0.1	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Volume of pores (<30 µm)	75	-	Decreasing	0.3	0.1	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Volume of pores (>30 µm)	75	-	Increasing	0.1	-	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Aggregates (> 2 mm)	75	-	Increasing	0.1	-	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Aggregates (2-0.25 mm)	75	-	Decreasing	0.1	-	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Aggregates (0.25-0.05 mm)	75	-	Decreasing	0.1	-	78
*PES	Fiber	<0.05	<2.65	-	1.325	Soil properties	Aggregates (<0.05 mm)	75	-	Decreasing	0.3	0.1	78
*PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	Root biomass	Increasing	0.2	-	48
PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	non-arbuscular mycorrhizal fungi hyphae	Increasing	0.2	-	48
PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	Coils in roots	Increasing	0.2	-	48
PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	non-arbuscular mycorrhizal fungi in roots	Increasing	0.2	-	48
*PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	Onion bulbs dry biomass	Increasing	0.2	-	48
PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	Leaf nitrogen content	Decreasing	0.2	-	48
PES	Fiber	0.008	5	-	5	Plant	<i>Allium fistulosum</i>	45	C-N ratio	Increasing	0.2	-	48
*PES	Fiber	0.008	5	-	5	Microbial & enzymes	Microbial activity	45	-	Increasing	2	-	48

Table S2 (continued)

Microplastic		Target response variable				Test condition		Significant differences			Ref. (No.)		
Composition	Shape	Width (diameter) mm	Length	Others	Final value	Classification	Response variable	Test duration	Biotic endpoint	Trends		Concentration (%)	NOEC (%)
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Food intake rate	Decreasing	0.014	0.0014	71
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Excretion rate	Decreasing	0.0014	-	71
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Histopathological change	Decreasing	0.071	0.014	71
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Glutathione peroxidase	Decreasing	0.071	0.014	71
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Total antioxidant capacity	Decreasing	0.071	0.014	71
PET	Fiber	0.0763	1.2578	-	1.2578	Snail	<i>Achatina fulica</i>	28	Malondialdehyde	Increasing	0.071	0.014	71
PET	Fragment	0.222-0.258	-	-	0.24	Plant	<i>Allium fistulosum</i>	45	Root-leave ratio	Increasing	2	-	48
*PET	Fragment	0.222-0.258	-	-	0.24	Soil properties	Bulk density	45	-	Decreasing	2	-	48
*PET	Fragment	0.222-0.258	-	-	0.24	Soil properties	Water availability	45	-	Increasing	2	-	48
*PP	Fragment	0.647-0.754	-	-	0.7005	Soil properties	Bulk density	45	-	Decreasing	2	-	48
*PP	Fragment	0.647-0.754	-	-	0.7005	Soil properties	Water availability	45	-	Increasing	2	-	48
*PP	Particle	<0.18	-	-	0.09	Microbial & enzymes	Fluorescein diacetate hydrolase	30	-	Increasing	7	-	9
*PP	Particle	<0.18	-	-	0.09	Microbial & enzymes	SUVA280	30	-	Increasing	28	7	9
*PP	Particle	<0.18	-	-	0.09	Microbial & enzymes	SUVA365	30	-	Increasing	28	7	9
*PP	Particle	<0.18	-	-	0.09	Soil properties	Dissolved organic carbon	30	-	Increasing	28	7	9
*PP	Particle	<0.18	-	-	0.09	Soil properties	Total phosphorus	30	-	Increasing	28	7	9
*PP	Particle	<0.18	-	-	0.09	Soil properties	Dissolved organic phosphorus	30	-	Increasing	7	-	9
*PP	Particle	<0.18	-	-	0.09	Soil properties	Total dissolved nitrogen	30	-	Increasing	7	-	9
*PP	Particle	<0.18	-	-	0.09	Soil properties	Dissolved organic nitrogen	30	-	Increasing	7	-	9
*PP	Powder	<0.25	-	-	0.125	Microbial & enzymes	β-glucosidase	30	-	Increasing	28	7	36
*PP	Powder	<0.25	-	-	0.125	Microbial & enzymes	Phosphatase	30	-	Increasing	7	-	36
PS	Bead	0.005	-	-	0.005	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.0008	0.0004	56
PS	Fragment	0.044	-	-	0.044	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.1	-	56
PS	Fragment	0.282	-	-	0.282	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.1	-	56
PS	Fragment	0.547-0.555	-	-	0.551	Plant	<i>Allium fistulosum</i>	45	Root-leave ratio	Increasing	2	-	48
*PS	Fragment	0.547-0.555	-	-	0.551	Soil properties	Bulk density	45	-	Decreasing	2	-	48
*PS	Fragment	0.547-0.555	-	-	0.551	Soil properties	Water availability	45	-	Increasing	2	-	48
PS	Fragment	0.676	-	-	0.676	Springtail	<i>Lobella sokamensis</i>	<1	Movement	Decreasing	0.1	-	56
PS	Particle	<0.250	-	-	0.125	Earthworm	<i>Eisenia fetida</i>	14	Superoxide dismutase	Decreasing	20	10	73
PS	Particle	<0.250	-	-	0.125	Earthworm	<i>Eisenia fetida</i>	14	Peroxidase	Increasing	1	-	73
PS	Particle	<0.250	-	-	0.125	Earthworm	<i>Eisenia fetida</i>	14	Catalase	Increasing	5	1	73
PS	Particle	<0.250	-	-	0.125	Earthworm	<i>Eisenia fetida</i>	14	Malondialdehyde	Increasing	20	10	73
*PS	Sphere	0.058	-	-	0.058	Earthworm	<i>Eisenia foetida</i>	30	Growth (weight)	Decreasing	1	0.5	4
*PVC	Particle	0.08-0.250	-	-	0.165	Springtail	<i>Folsomia candida</i>	28	Growth (weight)	Decreasing	0.1	-	41
*PVC	Particle	0.08-0.250	-	-	0.165	Springtail	<i>Folsomia candida</i>	28	Reproduction	Decreasing	0.1	-	41
PVC	Particle	0.08-0.250	-	-	0.165	Springtail	<i>Folsomia candida</i>	56	Gut microbe diversity	Decreasing	0.1	-	41

Table S3. List of available data for SSD-like analysis in Figure 2. Available data were classified from Table S2.

Classification	Target receptor	Endpoints	Conc. (%)	NOEC (%)	Final value (%)	Geomean	Ref.
Earthworm	<i>Eisenia foetida</i>	Growth (weight)	1.000	0.500	0.500	0.50	4
	<i>Lumbricus terrestris</i>	Growth	0.400	0.200	0.200		2
	<i>Lumbricus terrestris</i>	Survival	0.400	0.200	0.200	0.20	2
Microbial & enzymes	Catalase	-	0.008	-	0.003	0.33	51
	Fluorescein diacetate hydrolase	-	0.400	-	0.160		59
	Fluorescein diacetate hydrolase	-	7.000	-	2.800		9
	Fluorescein diacetate hydrolase	-	2.000	-	0.800		48
	Fluorescein diacetate hydrolase	-	2.000	-	0.800		48
	Fluorescein diacetate hydrolase	-	2.000	-	0.800		48
	Phosphatase	-	7.000	-	2.800		36
	SUVA280	-	28.000	7.000	7.000		9
	SUVA365	-	28.000	7.000	7.000		9
	Urease	-	0.008	-	0.003		51
β -glucosidase	-	28.000	7.000	7.000	36		
Plant	<i>Allium fistulosum</i>	Onion bulbs dry biomass	2.000	-	0.800	0.17	48
	<i>Allium fistulosum</i>	Onion bulbs dry biomass	0.200	-	0.080		48
	<i>Allium fistulosum</i>	Root biomass	0.200	-	0.080		48
	<i>Triticum aestivum</i>	Root biomass	1.000	-	0.400		28
	<i>Triticum aestivum</i>	Root biomass	1.000	-	0.400		0.40
Soil properties	<i>Triticum aestivum</i>	Root biomass	1.000	-	0.400	0.40	28
	Bulk density	-	2.000	-	0.800	0.80	48
	Bulk density	-	2.000	-	0.800		48
	Bulk density	-	2.000	-	0.800		48
	Bulk density	-	2.000	-	0.800		48
	Contents of aggregates (<0.05 mm)	-	0.300	0.100	0.100	78	
	Contents of aggregates (> 2 mm)	-	0.100	-	0.040	78	
	Contents of aggregates (0.25-0.05 mm)	-	0.100	-	0.040	0.09	78
	Contents of aggregates (2-0.25 mm)	-	0.100	-	0.040	78	
	Water stable aggregates	-	2.000	-	0.800	48	
	Dissolved organic carbon	-	28.000	7.000	7.000	7.00	9
	Dissolved organic nitrogen	-	7.000	-	2.800	2.80	9
	Dissolved organic phosphorus	-	7.000	-	2.800	2.80	9
	Evapotranspiration	-	2.000	-	0.800	0.80	48
	Total dissolved nitrogen	-	7.000	-	2.800	2.80	9
	Total phosphorus	-	28.000	7.000	7.000	7.00	9
	Volume of pores (<30 μ m)	-	0.300	0.100	0.100	78	
	Volume of pores (>30 μ m)	-	0.100	-	0.040	0.07	78
	Volume of pores (>30 μ m)	-	0.300	0.100	0.100	78	
	Water availability	-	2.000	-	0.800	0.80	48
Water availability	-	2.000	-	0.800	48		
Water availability	-	2.000	-	0.800	48		
Water availability	-	2.000	-	0.800	48		
Water availability	-	2.000	-	0.800	48		
Springtail	<i>Folsomia candida</i>	Growth (weight)	0.100	-	0.040	0.06	41
	<i>Folsomia candida</i>	Reproduction	0.100	-	0.040		41
	<i>Folsomia candida</i>	Reproduction	0.100	0.020	0.020		53
	<i>Folsomia candida</i>	Survival	1.000	0.500	0.500		53

Table S4. List of available data for SSD-like analysis in Figure 3A. Available data were classified from Table S2. There are 9 compositions of microplastic (high-density polyethylene, HDPE; low-density polyethylene, LDPE; polyamide, PA1; polyacrylic, PA2; polyethylene, PE; polyethylene terephthalate, PET; polyester, PES; polypropylene, PP; polystyrene, PS; polyvinyl chloride, PVC).

Composition	Shape	Width (diameter)	Length	Conc. (%)	NOEC (%)	Final value (%)	Geomean	Ref.
HDPE	Fragment	0.643	-	2.000	-	0.800	0.800	48
	Fragment	0.643	-	2.000	-	0.800		48
	Fragment	0.643	-	2.000	-	0.800		48
LDPE	Film	2	-	0.008	-	0.003	0.081	51
	Fragment	<0.150	-	0.400	0.200	0.200		2
	Fragment	<0.150	-	0.400	0.200	0.200		2
	Film	6.1	6.92	1.000	-	0.400		28
	Film	6.1	6.92	1.000	-	0.400		28
	Film	0.25-1	-	1.000	-	0.400		28
	Film	2	-	0.008	-	0.003		51
PA1	Fiber	0.026	0.37-3.14	0.400	-	0.160	0.160	59
PA2	Bead	0.015-0.020	-	2.000	-	0.800	0.800	48
	Bead	0.015-0.020	-	2.000	-	0.800		48
	Bead	0.015-0.020	-	2.000	-	0.800		48
	Bead	0.015-0.020	-	2.000	-	0.800		48
	Bead	0.015-0.020	-	2.000	-	0.800		48
PE	Bead	<0.5	-	0.100	0.020	0.020	0.100	53
	Bead	<0.5	-	1.000	0.500	0.500		53
PES	Fiber	<0.05	<2.65	0.300	0.100	0.100	0.082	78
	Fiber	<0.05	<2.65	0.100	-	0.040		78
	Fiber	<0.05	<2.65	0.100	-	0.040		78
	Fiber	<0.05	<2.65	0.100	-	0.040		78
	Fiber	0.008	5	2.000	-	0.800		48
	Fiber	0.008	5	0.200	-	0.080		48
	Fiber	0.008	5	0.200	-	0.080		48
	Fiber	<0.05	<2.65	0.300	0.100	0.100		78
	Fiber	<0.05	<2.65	0.100	-	0.040		78
	Fiber	<0.05	<2.65	0.300	0.100	0.100		78
PET	Fragment	0.222-0.258	-	2.000	-	0.800	0.800	48
	Fragment	0.222-0.258	-	2.000	-	0.800		48
PP	Fragment	0.647-0.754	-	2.000	-	0.800	3.329	48
	Particle	<0.18	-	28.000	7.000	7.000		9
	Particle	<0.18	-	7.000	-	2.800		9
	Particle	<0.18	-	7.000	-	2.800		9
	Particle	<0.18	-	7.000	-	2.800		9
	Powder	<0.25	-	7.000	-	2.800		36
	Particle	<0.18	-	28.000	7.000	7.000		9
	Particle	<0.18	-	28.000	7.000	7.000		9
	Particle	<0.18	-	7.000	-	2.800		9
	Particle	<0.18	-	28.000	7.000	7.000		9
	Fragment	0.647-0.754	-	2.000	-	0.800		48
	Powder	<0.25	-	28.000	7.000	7.000		36
PS	Fragment	0.547-0.555	-	2.000	-	0.800	0.684	48
	Sphere	0.058	-	1.000	0.500	0.500		4
PVC	Fragment	0.547-0.555	-	2.000	-	0.800	0.040	48
	Particle	0.08-0.250	-	0.100	-	0.040		41
	Particle	0.08-0.250	-	0.100	-	0.040		41

Table S5. List of available data for SSD-like analysis in Figure 3B. Available data were classified from Table S2. There are 9 compositions of microplastic (high-density polyethylene, HDPE; low-density polyethylene, LDPE; polyamide, PA1; polyacrylic, PA2; polyethylene, PE; polyethylene terephthalate, PET; polyester, PES; polypropylene, PP; polystyrene, PS; polyvinyl chloride, PVC).

Shape	Composition	Width (diameter)	Length	Conc. (%)	NOEC (%)	Final value (%)	Geomean	Ref.
Bead & Sphere	PA	0.015-0.020	-	2.000	-	0.800	0.442	48
	PA	0.015-0.020	-	2.000	-	0.800		48
	PA	0.015-0.020	-	2.000	-	0.800		48
	PA	0.015-0.020	-	2.000	-	0.800		48
	PA	0.015-0.020	-	2.000	-	0.800		48
	PE	<0.5	-	0.100	0.020	0.020		53
	PE	<0.5	-	1.000	0.500	0.500		53
Fiber	PA	0.026	0.37-3.14	0.400	-	0.160	0.087	59
	PES	<0.05	<2.65	0.300	0.100	0.100		78
	PES	<0.05	<2.65	0.100	-	0.040		78
	PES	<0.05	<2.65	0.100	-	0.040		78
	PES	<0.05	<2.65	0.100	-	0.040		78
	PES	0.008	5	2.000	-	0.800		48
	PES	0.008	5	0.200	-	0.080		48
	PES	0.008	5	0.200	-	0.080		48
	PES	<0.05	<2.65	0.300	0.100	0.100		78
	PES	<0.05	<2.65	0.100	-	0.040		78
PES	<0.05	<2.65	0.300	0.100	0.100	78		
Film	LDPE	2	-	0.008	-	0.003	0.057	51
	LDPE	6.1	6.92	1.000	-	0.400		28
	LDPE	6.1	6.92	1.000	-	0.400		28
	LDPE	0.25-1	-	1.000	-	0.400		28
	LDPE	2	-	0.008	-	0.003		51
Fragment	HDPE	0.643	-	2.000	-	0.800	0.622	48
	HDPE	0.643	-	2.000	-	0.800		48
	HDPE	0.643	-	2.000	-	0.800		48
	LDPE	<0.150	-	0.400	0.200	0.200		2
	LDPE	<0.150	-	0.400	0.200	0.200		2
	PET	0.222-0.258	-	2.000	-	0.800		48
	PET	0.222-0.258	-	2.000	-	0.800		48
	PP	0.647-0.754	-	2.000	-	0.800		48
	PP	0.647-0.754	-	2.000	-	0.800		48
	PS	0.547-0.555	-	2.000	-	0.800		48
PS	0.547-0.555	-	2.000	-	0.800	48		
Pellet & Particles & Powder	PP	<0.18	-	28.000	7.000	7.000	1.815	9
	PP	<0.18	-	7.000	-	2.800		9
	PP	<0.18	-	7.000	-	2.800		9
	PP	<0.18	-	7.000	-	2.800		9
	PP	<0.18	-	28.000	7.000	7.000		9
	PP	<0.18	-	28.000	7.000	7.000		9
	PP	<0.18	-	7.000	-	2.800		9
	PP	<0.18	-	28.000	7.000	7.000		9
	PVC	0.08-0.250	-	0.100	-	0.040		41
	PVC	0.08-0.250	-	0.100	-	0.040		41
	PP	<0.25	-	7.000	-	2.800		36
	PP	<0.25	-	28.000	7.000	7.000		36
	PS	0.058	-	1.000	0.500	0.500		4

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