

Supplementary Material

A global perspective on soil microplastic research: Status, challenges, and suggestions

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Table S1. Catalog of 150 papers for the analysis of the research status of soil MPs.

No.	Title	Year
1	Insight into the effect of microplastics on the adsorption and degradation behavior of thiamethoxam in agricultural soils.	2023
2	Insights into the influence of polystyrene microplastics on the bio-degradation behavior of tetrabromobisphenol A in soil	2024
3	Adsorption behaviors and bioavailability of tetrabromobisphenol A in the presence of polystyrene microplastic in soil: Effect of microplastics aging*	2023
4	Microplastic characteristics and microplastic-heavy metal synergistic contamination in agricultural soil under different cultivation modes in Chengdu, China	2023
5	Microplastic fibres affect soil fungal communities depending on drought conditions with consequences for ecosystem functions	2024
6	Divergent responses in microbial metabolic limitations and carbon use efficiency to variably sized polystyrene microplastics in soil	2024
7	Abundance and morphology of microplastics in an agricultural soil following long-term repeated application of pig manure	2021
8	Investigation on Microplastics in Soil near Landfills in the Republic of Korea	2023
9	Microplastic additions alter soil organic matter stability and bacterial community under varying temperature in two contrasting soils	2022
10	Paper Polypropylene microplastics affect the distribution and bioavailability of cadmium by changing soil components during soil aging	2023
11	Investigating the impact of microplastics on sulfur mineralization in different soil types: A mechanism study	2024
12	Fragmentation and depolymerization of microplastics in the earthworm gut: A potential for microplastic bioremediation?	2023
13	Antibiotics and microplastics in manure and surrounding soil of farms in the Loess Plateau: Occurrence and correlation	2024
14	Varying characteristics and driving mechanisms of antibiotic resistance genes in farmland soil amended with high-density polyethylene microplastics	2022
15	Microplastics as a Vector for HOC Bioaccumulation in Earthworm <i>Eisenia fetida</i> in Soil: Importance of Chemical Diffusion and Particle Size	2020
16	Examining sampling protocols for microplastics on recreational trails	2022
17	Microplastics reduced bioavailability and altered toxicity of phenanthrene to maize (<i>Zea mays</i> L.) through modulating rhizosphere microbial community and maize growth.	2023
18	Condition of composted microplastics after they have been buried for 30 years: Vertical distribution in the soil and degree of degradation	2024
19	The combined effects of azoxystrobin and different aged polyethylene microplastics on earthworms (<i>Eisenia fetida</i>): A systematic evaluation based	2024

	on oxidative damage and intestinal function	
20	Effects of microplastics and biochar on soil cadmium availability and wheat plant performance	2023
21	Different microplastics in anaerobic paddy soils: Altering methane emissions by influencing organic matter composition and microbial metabolic pathways	2023
22	Exploring the Occurrence Characteristics of Microplastics in Typical Maize Farmland Soils With Long-Term Plastic Film Mulching in Northern China	2021
23	Occurrence and distribution of microplastics in coastal plain soils under three land-use types	2023
24	Enhance in mobility of oxytetracycline in a sandy loamy soil caused by the presence of microplastics	2021
25	Distribution characteristics of microplastics in the soil of mangrove restoration wetland and the effects of microplastics on soil characteristics	2022
26	Seasonal variations and feedback from microplastics and cadmium on soil organisms in agricultural fields	2022
27	The Occurrence and Characteristics of Microplastic Pollution in the Agricultural Soils of Anhui Province, in Eastern China	2023
28	Distribution of microplastics in mulched soil in Xinjiang, China	2021
29	Contrasting effects of microplastics on sorption of diazepam and phenanthrene in soil	2021
30	Microplastic digestion generates fragmented nanoplastics in soils and damages earthworm spermatogenesis and coelomocyte viability	2021
31	Microplastics are ubiquitous and increasing in soil of a sprawling urban area, Phoenix (Arizona)	2024
32	Co-existence of polyethylene microplastics and tetracycline on soil microbial community and ARGs.	2023
33	Distribution and weathering characteristics of microplastics in paddy soils following long-term mulching: A field study in Southwest China	2023
34	The role of microplastics in the process of <i>Paraclostridium</i> sp. DLY7-assisted phytoremediation of phenanthrene contaminated soil	2024
35	New separation protocol reveals spray painting as a neglected source of microplastics in soils	2022
36	LDPE microplastics affect soil microbial community and form a unique plastisphere on microplastics	2022
37	Incorporation of microplastics from litter into burrows of <i>Lumbricus terrestris</i>	2017
38	Microplastics disrupt accurate soil organic carbon measurement based on chemical oxidation method	2021
39	Accumulation of HOCs via Precontaminated Microplastics by Earthworm <i>Eisenia fetida</i> in Soil	2020
40	Organic fertilizer and irrigation water are the primary sources of microplastics	2023

	in the facility soil, Beijing	
41	Preferential Emission of Microplastics from Biosolid-Applied Agricultural Soils: Field Evidence and Theoretical Framework	2024
42	Effects of Microplastics in Soil Ecosystems: Above and Below Ground	2019
43	Biochar alleviated the toxic effects of microplastics-contaminated geocarposphere soil on peanut (<i>Arachis hypogaea</i> L.) pod development: roles of pod nutrient metabolism and geocarposphere microbial modulation	2024
44	Quantification of Microplastics in Soils Using Accelerated Solvent Extraction: Comparison with a Visual Sorting Method	2021
45	Microplastics are transferred by soil fauna and regulate soil function as material carriers	2023
46	Physicochemical properties of environmental media can affect the adsorption of arsenic (As) by microplastics	2023
47	Sewage sludge application as a vehicle for microplastics in eastern Spanish agricultural soils	2020
48	Plastic Bag Derived-Microplastics as a Vector for Metal Exposure in Terrestrial Invertebrates	2017
49	Microplastics affect soil bacterial community assembly more by their shapes rather than the concentrations	2023
50	Minimal Impacts of Microplastics on Soil Physical Properties under Environmentally Relevant Concentrations	2023
51	Chronic and Transgenerational Effects of Polystyrene Microplastics at Environmentally Relevant Concentrations in Earthworms (<i>Eisenia fetida</i>)	2021
52	Microplastics pollution in the soils of various land-use types along Sheshui River basin of Central China	2022
53	Effects of microplastics on soil microbiome: The impacts of polymer type, shape, and concentration	2022
54	Exploring the interaction between microplastics and heavy metals: unveiling the impact of microplastics on lead sorption and desorption in soil	2023
55	Biodegradable microplastics enhance soil microbial network complexity and ecological stochasticity	2022
56	Flooding frequency and floodplain topography determine abundance of microplastics in an alluvial Rhine soil	2022
57	Microplastic appraisal of soil, water, ditch sediment and airborne dust: The case of agricultural systems	2023
58	Interactive effects of microplastics, biochar, and earthworms on CO and NO emissions and microbial functional genes in vegetable-growing soil ²²	2022
59	Identification of microplastics extracted from field soils amended with municipal biosolids	2024
60	Biochar Mitigates the Negative Effects of Microplastics on Sugarcane Growth	2024

	by Altering Soil Nutrients and Microbial Community Structure and Function	
61	Microplastics reduce soil microbial network complexity and ecological deterministic selection	2022
62	A simple method for the extraction and identification of light density microplastics from soil	2018
63	Accumulation of microplastics in soil after long-term application of biosolids and atmospheric deposition	2024
64	Microplastics in an agricultural soil following repeated application of three types of sewage sludge: A field study	2021
65	Biodegradable and conventional microplastics exhibit distinct microbiome, functionality, and metabolome changes in soil	2022
66	Biodegradable microplastics induced the dissemination of antibiotic resistance genes and virulence factors in soil: A metagenomic perspective	2022
67	Microplastic characteristic in the soil across the Tibetan Plateau	2022
68	A case on source to soil to solutions: Distribution characteristics of microplastics in farmland soil of the largest vegetable base in Northwest China	2024
69	Microplastics lag the leaching of phenanthrene in soil and reduce its bioavailability to wheat	2022
70	Effect of different types and shapes of microplastics on the growth of lettuce.	2023
71	Microplastic digestion generates fragmented nanoplastics in soils and damages earthworm spermatogenesis and coelomocyte viability	2021
72	Microplastics in agricultural soils on the coastal plain of Hangzhou Bay, east China: Multiple sources other than plastic mulching film	2020
73	The environmental impact of mask-derived microplastics on soil ecosystems	2024
74	Effects of microplastics on soil organic carbon and greenhouse gas emissions in the context of straw incorporation: A comparison with different types of soil	2021
75	The Impacts of Microplastics on Sorption and Desorption Specifications of Iron in Soil	2023
76	Complex Bilateral Interactions Determine the Fate of PolystyreneMicro- and Nanoplastics and Soil Protists: Implications from a Soil Amoeba	2022
77	The research on the molecular spectroscopic recognition mechanism of microplastics in typical agricultural media	2024
78	Interference of microplastics on autotrophic microbiome in paddy soils: Shifts in carbon fixation rate, structure, abundance, co-occurrence, and assembly process	2024
79	The impact of microplastics on sulfur REDOX processes in different soil types: A mechanism study	2024
80	Occurrence characteristics and risk assessment of microplastics in agricultural	2024

	soils in the loess hilly gully area of Yan' an, China	
81	Plastic contamination of forest, urban, and agricultural soils: a case study of Yeosu City in the Republic of Korea	2021
82	Effects of Microplastics on Soil Carbon Mineralization: The Crucial Role of Oxygen Dynamics and Electron Transfer	2023
83	Deciphering the Fingerprint of Dissolved Organic Matter in the Soil Amended with Biodegradable and Conventional Microplastics Based on Optical and Molecular Signatures	2022
84	Soil heterogeneity in the horizontal distribution of microplastics influences productivity and species composition of plant communities	2022
85	Decrease in bioavailability of soil heavy metals caused by the presence of microplastics varies across aggregate levels	2020
86	Ecotoxicological impact of naproxen on <i>Eisenia fetida</i> : Unraveling soil contamination risks and the modulating role of microplastics	2024
87	Distribution of microplastics in soil by types of land use in metropolitan area of Seoul	2024
88	Microplastics alter Cr accumulation and fruit quality in Cr(VI) contaminated soil-cucumber system during the lifecycle: Insight from rhizosphere bacteria and root metabolism	2024
89	Occurrence, distribution and affecting factors of microplastics in agricultural soils along the lower reaches of Yangtze River, China	2021
90	Soil microorganisms play an important role in the detrimental impact of biodegradable microplastics on plants	2024
91	Response of soil property and microbial community to biodegradable microplastics, conventional microplastics and straw residue	2024
92	Microplastics occurrence and frequency in soils under different land uses on a regional scale	2021
93	Addition of polyvinyl pyrrolidone during density separation with sodium iodide solution improves recovery rate of small microplastics (20–150 μm) from soils and sediments	2022
94	Effects of biodegradable microplastics and straw addition on soil greenhouse gas emissions	2024
95	Discrepant responses of bacterial community and enzyme activities to conventional and biodegradable microplastics in paddy soil	2024
96	Vertical migration of microplastics along soil profile under different crop root systems	2021
97	The distribution and morphology of microplastics in coastal soils adjacent to the Bohai Sea and the Yellow Sea	2018
98	Microplastic contamination is ubiquitous in riparian soils and strongly related to elevation, precipitation and population density	2021

99	Quantification and characterization of microplastics in farmland soils of Jiangsu Province, East China	2023
100	Homogenization of bacterial plastisphere community in soil: a continental-scale microcosm study	2024
101	Defense responses in earthworms (<i>Eisenia fetida</i>) exposed to low-density polyethylene microplastics in soils	2020
102	Effect of Polyvinyl Chloride Microplastics on Bacterial Community and Nutrient Status in Two Agricultural Soils	2021
103	Production Potential of Greenhouse Gases Affected by Microplastics at Freshwater and Saltwater Ecosystems	2022
104	Automated identification and quantification of invisible microplastics in agricultural soils	2022
105	Microplastic transport during desertification in drylands: Abundance and characterization of soil microplastics in the Amu Darya-Aral Sea basin, Central Asia	2023
106	Impact of long-term conventional and biodegradable film mulching on microplastic abundance, soil structure and organic carbon in a cotton field	2024
107	Microplastic contamination in soils of urban allotment gardens (Toruń, Poland)	2024
108	Biodeterioration of Untreated Polypropylene Microplastic Particles by Antarctic Bacteria	2020
109	The positive effects of polypropylene and polyvinyl chloride microplastics on agricultural soil quality	2023
110	ToF-SIMS characterization of microplastics in soils	2020
111	The effects of high-density polyethylene and polypropylene microplastics on the soil and earthworm <i>Metaphire guillelmi</i> gut microbiota	2021
112	Microplastics distribution in different habitats of Ximen Island and the trapping effect of blue carbon habitats on microplastics	2022
113	Microbes drive metabolism, community diversity, and interactions in response to microplastic-induced nutrient imbalance	2023
114	Exposure to microplastics lowers arsenic accumulation and alters gut bacterial communities of earthworm <i>Metaphire californica</i>	2019
115	Microplastics Concentrations in Soil Along a Racetrack	2023
116	Distinct soil microplastic distributions under various farmland-use types around Urumqi, China	2023
117	Arbuscular Mycorrhizal Fungi Can Inhibit the Allocation of Microplastics from Crop Roots to Aboveground Edible Parts	2023
118	Metal type and aggregate microenvironment govern the response sequence of speciation transformation of different heavy metals to microplastics in soil	2021

119	Coexistence of microplastics and Cd alters soil N transformation by affecting enzyme activity and ammonia oxidizer abundance	2024
120	Size-dependent vector effects of microplastics on bioaccumulation of hydrophobic organic contaminants in earthworm: A dual-dosing study	2024
121	Vertically co-distributed vanadium and microplastics drive distinct microbial community composition and assembly in soil	2022
122	Widespread microplastic pollution in mangrove soils of Todos os Santos Bay, northern Brazil	2022
123	Inhibitory effect of polyethylene microplastics on roxarsone degradation in soils	2023
124	Trace metals coupled with plasticisers in microplastics strengthen the denitrification function of the soil microbiome in the Qinghai Tibetan Plateau	2024
125	Organic fertilizer facilitates the soil microplastic surface degradation and enriches the diversity of bacterial biofilm	2023
126	Microplastics combined with tetracycline in soils facilitate the formation of antibiotic resistance in the <i>Enchytraeus crypticus</i> microbiome	2020
127	Convolutional neural network for soil microplastic contamination screening using infrared spectroscopy	2020
128	Soil Metabolome Impacts the Formation of the Eco-corona and Adsorption Processes on Microplastic Surfaces	2023
129	Microplastic Accumulation in Agricultural Soils with Different Mulching Histories in Xinjiang, China	2023
130	Microplastics from mulching film is a distinct habitat for bacteria in farmland soil	2019
131	Adsorption of nonylphenol on coastal saline soil: Will microplastics play a great role?	2023
132	Microplastic pollution in rice-fish co-culture system: A report of three farmland stations in Shanghai, China	2019
133	Introducing a soil universal model method (SUMM) and its application for qualitative and quantitative determination of poly(ethylene), poly(styrene), poly(vinyl chloride) and poly(ethylene terephthalate) microplastics in a model soil	2019
134	Metal Release from Microplastics to Soil: Effects on Soil Enzymatic Activities and Spinach Production.	2023
135	Occurrence, sources, and relationships of soil microplastics with adsorbed heavy metals in the Ebinur Lake Basin, Northwest China	2022
136	Effects of photoaging on structure and characteristics of biofilms on microplastic in soil: Biomass and microbial community	2024

137	Significant influence of land use types and anthropogenic activities on the distribution of microplastics in soil: A case from a typical mining-agricultural city	2024
138	Comparison of Oil Extraction and Density Extraction Method to Extract Microplastics for Typical Agricultural Soils in China	2024
139	Occurrence and characteristics of microplastics in soils from greenhouse and open-field cultivation using plastic mulch film	2023
140	Microplastics influence on Hg methylation in diverse paddy soils	2022
141	Effects of microplastics on plant growth and arbuscular mycorrhizal fungal communities in a soil spiked with ZnO nanoparticles	2021
142	Effects of farmland residual mulch film-derived microplastics on the structure and function of soil and earthworm <i>Metaphire guillelmi</i> gut microbiota	2024
143	Accumulation of microplastics in greenhouse soil after long-term plastic film mulching in Beijing, China	2022
144	Microplastic particles alter wheat rhizosphere soil microbial community composition and function	2022
145	An integrated metagenomic model to uncover the cooperation between microbes and magnetic biochar during microplastics degradation in paddy soil	2023
146	Pesticide bioaccumulation in radish produced from soil contaminated with microplastics	2024
147	Short-term effects of polyethene and polypropylene microplastics on soil phosphorus and nitrogen availability	2022
148	Modulation of chlorpyrifos toxicity to soil arthropods by simultaneous exposure to polyester microfibers or tire particle microplastics	2023
149	The role of microplastics in the process of laccase-assisted phytoremediation of phenanthrene-contaminated soil	2023
150	Concurrence of microplastics and heat waves reduces rice yields and disturbs the agroecosystem nitrogen cycle	2023