

Supplementary Table 1. Differentially abundant fungal taxa at the genus level ($p < 0.05$) as per DESeq2. The mean relative abundance column represents the mean rarefied abundance across all soil samples. Change (\log_2 fold) indicates the multiplicative change in taxon abundance between soil origins. Negative numbers indicate association with bulk samples, and positive numbers indicate association with rhizosphere samples. The adjusted p-value column show the FDR corrected p-value. Each indicator taxa also includes FUNGuild assignment for trophic mode and guild. The level at which the guild and trophic mode assignment was made is reported in the Level

Mean Relative Abundance	Change (\log_2 Fold)	Association	Adjusted p -value	Taxonomy	Level of guild assignment	Trophic Mode assignment	Guild Assignment
45.93554454	- 5.352948395	Bulk	0.0221246	Ascomycota;Dothideomycetes;Pleosporales;Phaeosphaeriaceae;Ophiosphaerella	Ophiosphaerella	Saprotroph	Undefined Saprotroph
101.468543	- 0.893293861	Bulk	0.0243643	Ascomycota;Dothideomycetes;Pleosporales;Torulaceae;Dendryphion	Dendryphion	Pathotroph	Plant Pathogen
18.41881538	- 7.095314948	Bulk	0.0024926	Ascomycota;Eurotiomycetes;Onygenales;Onygenales_fam_Incertae_sedis;Chrysosporium	NA	NA	NA
12.95772077	-3.38778474	Bulk	0.0216973	Ascomycota;Pezizomycetes;Pezizales;Ascobolaceae;Ascobolus	Ascobolaceae	Saprotroph	Dung Saprotroph-Soil Saprotroph-Wood Saprotroph
4357.721813	- 1.687321829	Bulk	0.0216973	Ascomycota;Pezizomycetes;Pezizales;Pyronemataceae;Kotlabaea	Kotlabaea	Saprotroph	Undefined Saprotroph
31.02619535	-7.67210468	Bulk	0.0243643	Ascomycota;Pezizomycetes;Pezizales;Pyronemataceae;Pseudaleuria	Pseudaleuria	Saprotroph	Undefined Saprotroph
1697.29219	-0.9923871	Bulk	0.0221246	Ascomycota;Sordariomycetes;Sordariales;Chaetomiaceae;Botryotrichum	Botryotrichum	Saprotroph	Undefined Saprotroph
493.8889389	2.361508735	Rhizosphere	3.13E-05	Ascomycota;Dothideomycetes;Pleosporales;Phaeosphaeriaceae;Setophoma	Phaeosphaeriaceae	Pathotroph-Saprotroph	Fungal Parasite-Plant Pathogen-Plant Saprotroph
526.9315674	3.040481782	Rhizosphere	0.0020997	Ascomycota;Sordariomycetes;Hypocreales;Nectriaceae;Ilyonectria	Ilyonectria	Pathotroph	Plant Pathogen
11.64539771	22.35517446	Rhizosphere	3.27E-12	Ascomycota;Sordariomycetes;Hypocreales;Nectriaceae;Volutella	Nectriaceae	Pathotroph-Saprotroph-Symbiotroph	Animal Pathogen-Endophyte-Fungal Parasite-Lichen Parasite-Plant Pathogen-Wood Saprotroph
17.18429639	8.003845695	Rhizosphere	0.0070517	Ascomycota;Sordariomycetes;Xylariales;Diatrypaceae;Monosporascus	Diatrypaceae	Pathotroph-Saprotroph	Plant Pathogen-Plant Saprotroph
96.74783218	25.30799831	Rhizosphere	2.08E-15	Basidiomycota;Agaricomycetes;Polyporales;Meruliaceae;Uncobasidium	Meruliaceae	Pathotroph-Saprotroph	Plant Pathogen-Undefined Saprotroph

of Guild Assignment column.

Supplementary Table 2. Differentially abundant bacterial taxa at the genus level ($p < 0.01$) as per DESeq2. The mean relative abundance column represents the mean rarefied abundance across all soil samples. Change (Log₂ fold) indicates the multiplicative change in taxon abundance between soil origins. Negative numbers indicate association with bulk samples, and positive numbers indicate association with rhizosphere samples. The adjusted p-value column show the FDR corrected p-value.

Mean Relative Abundance	Change (log ₂ Fold)	Association	Adjusted p-value	Taxonomy
16.5990731	- 2.43853437	Bulk	0.00082594	Bacteria;Abditibacteriota;Abditibacteria;Abditibacteriales;Abditibacteriaceae;Abditibacterium
173.124814	- 1.02804751	Bulk	1.88E-10	Bacteria;Acidobacteriota;Acidobacteriae;Bryobacteriales;Bryobacteraceae;Bryobacter
88.2990841	- 1.13900204	Bulk	5.96E-05	Bacteria;Acidobacteriota;Blastocatellia;Blastocatellales;Blastocatellaceae;Aridibacter
71.1417166	- 1.14680476	Bulk	0.00016822	Bacteria;Acidobacteriota;Blastocatellia;Blastocatellales;Blastocatellaceae;Blastocatella
128.505259	- 1.91828171	Bulk	8.49E-05	Bacteria;Acidobacteriota;Blastocatellia;Blastocatellales;Blastocatellaceae;JGI_0001001-H03
452.304907	- 1.95862956	Bulk	1.75E-19	Bacteria;Acidobacteriota;Blastocatellia;Blastocatellales;Blastocatellaceae;Stenotrophobacter
1432.09311	- 1.60294531	Bulk	1.14E-19	Bacteria;Acidobacteriota;Blastocatellia;Pyrinomonadales;Pyrinomonadaceae;RB41
5.67920713	- 5.62019746	Bulk	0.00609602	Bacteria;Actinobacteriota;Actinobacteria;Micromonosporales;Micromonosporaceae;Luedemannella
96.1291365	- 1.35987792	Bulk	0.00016142	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Ferruginibacter
6.90057196	- 5.91207244	Bulk	0.00316018	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Flaviaesturariibacter
134.447504	- 1.31567627	Bulk	2.67E-05	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Flavisolibacter
44.2320779	- 1.40440935	Bulk	1.74E-05	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Flavitalea
8.35668484	- 4.45561712	Bulk	0.001011	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Segetibacter
378.019279	- 0.62127527	Bulk	0.00447463	Bacteria;Bacteroidota;Bacteroidia;Cytophagales;Hymenobacteraceae;Adhaeribacter
8.70722565	- 3.08514323	Bulk	0.00238726	Bacteria;Fibrobacterota;Fibrobacteria;Fibrobacteriales;Fibrobacteraceae;possible_genus_04
57.4157409	-2.1439789	Bulk	0.00083491	Bacteria;Gemmatimonadota;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;Gemmatimonas
3.97240178	- 5.11472721	Bulk	0.00638642	Bacteria;Gemmatimonadota;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;Roseisolibacter
82.694573	- 0.90592921	Bulk	5.96E-05	Bacteria;Nitrospirota;Nitrospiria;Nitrospirales;Nitrospiraceae;Nitrospira

505.576938	- 0.70723879	Bulk	0.00831063	Bacteria;Planctomycetota;Planctomycetes;Pirellulales;Pirellulaceae;Pir4_lineage
319.379023	- 0.90940169	Bulk	0.00015772	Bacteria;Planctomycetota;Planctomycetes;Pirellulales;Pirellulaceae;Pirellula
267.155109	- 1.61492607	Bulk	2.36E-07	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Nitrosomonadaceae;Nitrospira
20.8249213	- 2.55881307	Bulk	0.00088846	Bacteria;Verrucomicrobiota;Verrucomicrobiae;Chthoniobacterales;Chthoniobacteraceae;Candidatus_Udaeobacter
133.57254	- 0.86922509	Bulk	0.00091493	Bacteria;Verrucomicrobiota;Verrucomicrobiae;Opitutales;Opitutaceae;Opitutus
36.5616111	- 1.43494794	Bulk	1.85E-05	Bacteria;Verrucomicrobiota;Verrucomicrobiae;Pedosphaerales;Pedosphaeraceae;ADurb.Bin063-1
60.5821759	0.9884899	Rhizosphere	0.00061545	Bacteria;Acidobacteriota;Vicinamibacteria;Vicinamibacterales;Vicinamibacteraceae;Luteitalea
70.8146534	5.85428784	Rhizosphere	1.72E-20	Bacteria;Actinobacteriota;Actinobacteria;Glycomycetales;Glycomycetaceae;Glycomyces
14.9506489	4.45974544	Rhizosphere	0.00467375	Bacteria;Actinobacteriota;Actinobacteria;Micrococcales;Intrasporangiaceae;Intrasporangium
80.1083805	1.82716549	Rhizosphere	1.48E-06	Bacteria;Actinobacteriota;Actinobacteria;Micrococcales;Microbacteriaceae;Agromyces
76.0495264	4.35149389	Rhizosphere	5.73E-10	Bacteria;Actinobacteriota;Actinobacteria;Micrococcales;Promicromonosporaceae;Promicromonospora
137.149452	0.96567871	Rhizosphere	0.00366405	Bacteria;Actinobacteriota;Actinobacteria;Micromonosporales;Micromonosporaceae;Actinoplanes
123.962052	3.28146781	Rhizosphere	3.03E-22	Bacteria;Actinobacteriota;Actinobacteria;Propionibacterales;Nocardiodaceae;Aeromicrobium
32.3641723	2.33668169	Rhizosphere	5.15E-05	Bacteria;Actinobacteriota;Actinobacteria;Propionibacterales;Nocardiodaceae;Kribbella
198.489269	1.7715479	Rhizosphere	1.24E-07	Bacteria;Actinobacteriota;Actinobacteria;Propionibacterales;Nocardiodaceae;Nocardioides
24.988121	6.53596015	Rhizosphere	6.07E-11	Bacteria;Actinobacteriota;Actinobacteria;Pseudonocardiales;Pseudonocardiaceae;Amycolatopsis
57.1415724	3.11737148	Rhizosphere	0.00069013	Bacteria;Actinobacteriota;Actinobacteria;Pseudonocardiales;Pseudonocardiaceae;Kibdelosporangium
537.610521	6.26470357	Rhizosphere	1.93E-20	Bacteria;Actinobacteriota;Actinobacteria;Pseudonocardiales;Pseudonocardiaceae;Lechevalieria
849.189235	5.42264207	Rhizosphere	1.77E-65	Bacteria;Actinobacteriota;Actinobacteria;Streptomycetales;Streptomycetaceae;Streptomyces
84.1258478	3.30670121	Rhizosphere	4.39E-08	Bacteria;Actinobacteriota;Actinobacteria;Streptosporangiales;Streptosporangiaceae;Nonomuraea
8.06543724	5.93963893	Rhizosphere	2.01E-05	Bacteria;Bacteroidota;Bacteroidia;Chitinophagales;Chitinophagaceae;Taibaiella
26.0608903	1.99766363	Rhizosphere	2.17E-06	Bacteria;Bacteroidota;Bacteroidia;Cytophagales;Cytophagaceae;Rhodocytophaga
92.957892	0.88391457	Rhizosphere	0.00727113	Bacteria;Bacteroidota;Bacteroidia;Cytophagales;Microscillaceae;Ohtaekwangia
31.873766	6.05934747	Rhizosphere	1.13E-07	Bacteria;Bacteroidota;Bacteroidia;Cytophagales;Spirosomaceae;Dyadobacter
14.616628	3.84426618	Rhizosphere	0.00459442	Bacteria;Bacteroidota;Bacteroidia;Flavobacteriales;Crocinitomicaceae;Fluviicola
75.3022863	2.62824733	Rhizosphere	5.77E-09	Bacteria;Bacteroidota;Bacteroidia;Flavobacteriales;Flavobacteriaceae;Flavobacterium
48.313255	1.77982734	Rhizosphere	6.00E-06	Bacteria;Chloroflexi;Chloroflexia;Chloroflexales;Herpetosiphonaceae;Herpetosiphon
3.00637059	5.32206763	Rhizosphere	0.00771937	Bacteria;Proteobacteria;Alphaproteobacteria;Caulobacterales;Caulobacteraceae;Asticcacaulis
42.7419798	1.83368049	Rhizosphere	0.00638642	Bacteria;Proteobacteria;Alphaproteobacteria;Caulobacterales;Caulobacteraceae;Brevundimonas
69.9961165	3.45379239	Rhizosphere	7.86E-05	Bacteria;Proteobacteria;Alphaproteobacteria;Caulobacterales;Caulobacteraceae;Caulobacter

274.490404	3.25705776	Rhizosphere	2.15E-22	Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Devosiaceae;Devosia
85.9447005	2.62088572	Rhizosphere	5.77E-09	Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium
18.5553214	4.32706807	Rhizosphere	2.82E-05	Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Ensifer
74.8479037	1.17969897	Rhizosphere	0.00110086	Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Altererythrobacter
68.7278206	3.49560919	Rhizosphere	2.48E-06	Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingobium
38.1178609	6.06235177	Rhizosphere	6.87E-09	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Comamonadaceae;Variovorax
15.5622734	3.19582413	Rhizosphere	0.00365348	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Methylophilaceae;Methylobacillus
15.6741545	7.70611953	Rhizosphere	0.00013009	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Oxalobacteraceae;Duganella
245.890554	2.90777435	Rhizosphere	2.17E-19	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Oxalobacteraceae;Massilia
10.1593637	7.07698393	Rhizosphere	3.05E-05	Bacteria;Proteobacteria;Gammaproteobacteria;Burkholderiales;Oxalobacteraceae;Pseudoduganella
81.2346808	2.49485057	Rhizosphere	3.14E-05	Bacteria;Proteobacteria;Gammaproteobacteria;Cellvibrionales;Cellvibrionaceae;Cellvibrio
117.752469	1.57490743	Rhizosphere	6.87E-09	Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas
132.703812	2.19836499	Rhizosphere	5.77E-09	Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Arenimonas
77.2563267	5.06644133	Rhizosphere	1.93E-07	Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Luteimonas
92.4938038	3.51752566	Rhizosphere	5.73E-10	Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Pseudoxanthomonas
27.1330252	2.95612119	Rhizosphere	0.00366405	Bacteria;Verrucomicrobiota;Verrucomicrobiae;Opitutales;Opitutaceae;Lacunisphaera
153.811853	1.97536577	Rhizosphere	5.28E-05	Bacteria;Verrucomicrobiota;Verrucomicrobiae;Verrucomicrobiales;Rubritaleaceae;Luteolibacter
