

A Comprehensive Metagenomic Analysis of Bacterial and Fungal Microbiome Responses to Leaf-Based Compost Amendment in Soil, Unveiling the Bio-Fertilizing Potential

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Supplementary Information

Supplementary Table S1: Operational Taxonomic Unit (OTU) of the bacterial phyla detected in pre-plantation and post-harvest soils amended with different composts

Phylum	Pre-plantation soils with OTUs						Post-harvest soils with OTUs									
	YC	YD	YK	YM	YV	YF	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
<i>Proteobacteria</i>	17403	23532	45575	57753	30021	81283	13684	46664	41494	30138	9946	47197	32289	30254	53374	44137
<i>Planctomycetes</i>	6594	10578	6847	22498	14486	40131	8924	29308	21839	19215	8423	27764	11065	7779	11093	12821
<i>Actinobacteria</i>	2611	3335	6736	10980	4899	18452	3343	10878	10580	7538	2881	12448	9355	8916	12758	13700
<i>Firmicutes</i>	9680	5363	12733	13258	6278	37115	4644	6546	18054	6025	3239	7337	1086	1178	3344	939
<i>Chloroflexi</i>	23657	11493	15112	36788	17529	55091	10729	16782	13700	14137	4361	18677	10665	6764	13415	9568
<i>Acidobacteria</i>	2611	3335	6736	10980	4899	18452	3343	10878	10580	7538	2881	12448	9355	8916	12758	13700
<i>Bacteroidetes</i>	8044	5106	16476	21780	10242	20104	3013	7846	7375	5141	1288	9725	15190	15305	21034	20170
<i>Verrucomicrobia</i>	638	1189	1224	2364	1800	5121	1293	4074	3912	2651	737	5303	3892	4316	7368	6008
<i>Gemmatimonadetes</i>	83	188	254	365	266	952	277	1069	509	587	149	1358	424	171	972	332
<i>Armatimonadetes</i>	63	84	249	326	206	585	85	337	327	202	56	541	278	525	638	854
<i>Cyanobacteria</i>	576	892	508	1117	1755	9142	101	288	433	259	87	480	365	411	641	514
<i>Euryarchaeota</i>	931	473	442	1771	1353	2755	184	133	127	101	36	184	369	337	369	429
<i>[Thermi]</i>	341	439	649	4310	296	1198	107	71	273	269	30	112	243	119	207	121
<i>Nitrospirae</i>	212	273	398	980	491	2627	235	810	642	442	283	1114	338	217	361	412
<i>Chlamydiae</i>	200	296	342	546	416	1613	377	1186	989	862	161	1672	64	88	89	154
Total OTU	73644	66576	114281	185816	94937	294621	50339	136870	130834	95105	34558	146360	94978	85296	138421	123859

Supplementary Table S2: Operational Taxonomic Unit (OTU) of the fungal phyla detected in pre-plantation and post-harvest soils amended with different composts

Phylum	YC	YD	YK	YM	YV	YF	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
Ascomycota	35811	55376	52834	14760	10781	50040	13	44782	21767	15647	53738	58445	16625	33906	10838	10060
Basidiomycota	11140	16764	51250	21690	16148	31416	2	30009	13818	17930	26054	29450	27072	21341	11414	31977
Blastocladiomycota	14	2	198	5	6	29	0	145	25	3	1	20	0	2	38	16
Chlorophyta	0	0	2	0	1	0	0	0	2	0	3	0	0	0	0	0
Chytridiomycota	7	20	43	1	4	4	0	4	8	9	21	26	677	1149	328	281
Mucoromycota	387	231	191	18	48	97	0	825	880	89	2836	699	590	153	74	186
Olpidiomycota	841	654	4243	551	3	3006	0	719	202	558	110	214	0	1	0	0
Zoopagomycota	29	53	94	14	34	56	0	390	109	66	89	130	17	61	37	33
Total OTUs	48229	73100	108855	37039	27025	84648	15	76874	36811	34302	82852	88984	44981	56613	22729	42553

YC: Pre-plantation floodplain soil with cow dung amendment; **YD:** Pre-plantation floodplain soil with leaf compost amendment; **YK:** Pre-plantation floodplain soil with kitchen compost amendment; **YM:** Pre-plantation floodplain soil with municipal organic waste compost amendment; **YV:** Pre-plantation floodplain soil with vermicompost amendment; **YF:** Pre-plantation floodplain soil with chemical fertilizer amendment; **YCRAH:** Post-harvest floodplain soil with cow dung amendment; **YDRAH:** Post-harvest floodplain soil with leaf compost amendment; **YKRAH:** Post-harvest floodplain soil with kitchen compost amendment; **YMRAH:** Post-harvest floodplain soil with municipal organic waste compost amendment; **YVRAH:** Post-harvest floodplain soil with vermicompost amendment; **YFRAH:** Post-harvest floodplain soil with chemical fertilizer amendment; **NCRAH:** Post-harvest residential soil with cow dung amendment; **NDRAH:** Post-harvest residential soil with leaf compost amendment; **NKRAH:** Post-harvest residential soil with kitchen compost amendment; **NFRAH:** Post-harvest residential soil with chemical fertilizer amendment.

Supplementary Table S3: Operational Taxonomic Unit (OTU) of the beneficial bacterial genera detected in pre-plantation soils amended with different composts

Genera	General function	YC	YD	YK	YM	YV	YF
<i>Actinomadura</i>	<i>Plant growth promoter/ P solubilizer</i>	34	1	670	426	9	3
<i>Agromyces</i>	<i>Plant growth promoter/ P solubilizer</i>	203	441	358	470	267	1056
<i>Bacillus</i>	<i>Plant growth promoter/Biocontrol</i>	261	69	554	514	80	658
<i>Clostridium</i>	<i>N fixture</i>	20	22	19	59	25	63
<i>Myxococcus</i>	<i>Decomposer/Bio-control</i>	114	300	510	1196	226	692
<i>Halomonas</i>	<i>Plant growth promoter</i>	2223	2	2038	63	13	2
<i>Nitrospira</i>	<i>Plant growth promoter; Nitrification</i>	156	254	346	831	349	1976
<i>Planctomyces</i>	<i>Plant growth promoter</i>	1144	1395	1221	4689	2407	5981
<i>Rhodoplanes</i>	<i>Plant growth promoter</i>	136	202	333	553	186	675
<i>Sphingobacterium</i>	<i>Plant growth promoter; P solubilizer</i>	31	44	1162	83	56	183
<i>Flavobacterium</i>	<i>Plant growth promoter; P solubilizer</i>	110	224	409	482	683	1442
<i>Geobacter</i>	<i>Plant growth promoter</i>	11	4	29	40	13	146
<i>Pseudomonas</i>	<i>Plant growth promoter; Biocontrol</i>	120	116	524	234	259	541
<i>Streptomyces</i>	<i>Plant growth promoter; Biocontrol</i>	2005	292	467	5423	245	2236
<i>Mycobacterium</i>	<i>Plant growth promoter; Biocontrol</i>	409	579	1436	928	286	800
<i>Leptolyngbya</i>	<i>Decomposer; N fixture</i>	159	157	166	204	127	1222
<i>Phaeospirillum</i>	<i>Photoheterotrophic</i>	20	48	57	136	38	202
<i>C.Solibacter</i>	<i>Decomposer</i>	63	82	129	295	105	467
<i>Gemmata</i>	<i>Chemoheterotrophs</i>	206	438	347	1107	543	2334
<i>Achromobacter</i>	<i>Decomposer; Plant growth promoter</i>	69	238	19	25	46	38
<i>Alcanivorax</i>	<i>Bioremediation of hydrocarbons</i>	7	8	740	229	36	10
<i>Methanobacterium</i>	<i>Methane producers</i>	43	186	98	354	51	890
<i>Methanosarcina</i>	<i>Methane producers</i>	632	1	12	90	67	35
<i>Lactobacillus</i>	<i>Lactic acid fermentation</i>	20	16	94	16	132	59
<i>Xiphinematobacter</i>	<i>Decomposer; Plant growth promoter</i>	46	220	21	107	42	231
<i>Alicyclobacillus</i>	<i>Decomposer</i>	100	416	611	867	528	1811
<i>Steroidobacter</i>	<i>Decomposer; Steroid degradation</i>	276	292	416	883	327	670
TOTAL OTUs		17236	12094	25572	40608	14292	48846

Supplementary Table S4: Operational Taxonomic Unit (OTU) of the beneficial bacterial genera detected in post-harvest soils amended with different composts

Genera	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
<i>Actinomadura</i>	27	9	259	73	27	2	11	16	740	6
<i>Agromyces</i>	74	348	208	148	90	331	21	23	4	10
<i>Bacillus</i>	417	137	1052	430	58	78	40	34	276	38
<i>Clostridium</i>	128	53	114	43	32	40	1	2	25	2
<i>Myxococcus</i>	74	573	353	428	75	384	53	65	42	254
<i>Halomonas</i>	0	0	1	0	1	0	1	2	6	2
<i>Nitrospira</i>	214	770	618	412	226	970	286	197	336	363
<i>Planctomyces</i>	1208	3609	2779	2631	1323	3325	1492	856	1338	1356
<i>Rhodoplanes</i>	123	510	485	322	125	485	203	153	263	275
<i>Sphingobacterium</i>	0	0	4	1	1	8	11	6	7	11
<i>Flavobacterium</i>	35	48	95	37	63	103	78	67	88	195
<i>Geobacter</i>	20	159	99	93	22	248	38	45	225	17
<i>Pseudomonas</i>	73	33	57	27	29	290	24	21	41	62
<i>Streptomyces</i>	15	39	114	37	8	24	42	43	36	36
<i>Mycobacterium</i>	174	634	573	500	137	483	90	158	166	74
<i>Leptolyngbya</i>	7	27	30	19	7	77	1	0	21	0
<i>Phaeospirillum</i>	55	110	106	80	24	132	83	137	174	266
<i>C.Solibacter</i>	88	182	167	149	41	258	217	150	366	213
<i>Gemmata</i>	790	2680	1498	2175	781	2687	334	287	471	506
<i>Achromobacter</i>	36	140	7	17	13	48	55	13	27	70
<i>Alcanivorax</i>	1	3	18	1	1	0	0	1	0	0
<i>Methanobacterium</i>	4	23	29	16	1	29	2	0	0	0
<i>Methanosarcina</i>	90	1	4	3	5	0	14	0	9	2
<i>Lactobacillus</i>	20	21	70	27	11	26	37	82	67	76
<i>Xiphinematobacter</i>	72	242	427	133	29	347	18	126	187	88
<i>Alicyclobacillus</i>	161	824	532	356	130	1095	2	3	1	7
<i>Steroidobacter</i>	343	1894	1559	1090	263	1000	1927	1025	2802	1275
Total	4249	13069	11258	9248	3523	12470	5081	3512	7718	5204

Supplementary Table S5: Operational Taxonomic Unit (OTU) of the pathogenic bacterial genera detected in pre-plantation soils amended with different composts

Genera		YC	YD	YK	YM	YV	YF
<i>Agrobacterium</i>	Plant tumor	1	376	5	0	9	3
<i>Corynebacterium</i>	Cankers/ Dieback	4	3	365	6	62	28
<i>Burkholderia</i>	panicle blight in rice	1	0	1	7	12	4
<i>Prevotella</i>	Human pathogen	6	4	17	10	21	20
<i>Legionella</i>	Human pathogen	5	7	9	18	6	25
<i>Nocardia</i>	Human pathogen	28	198	80	191	9	18
Total		45	588	477	232	119	98

Supplementary Table S6: Operational Taxonomic Unit (OTU) of the pathogenic bacterial genera detected in post-harvest soils amended with different composts

Genera	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
<i>Agrobacterium</i>	18	131	6	142	16	24	40	68	31	43
<i>Corynebacterium</i>	11	6	64	16	5	3	4	1	32	5
<i>Burkholderia</i>	3	1	7	10	2	13	0	2	2	0
<i>Prevotella</i>	0	1	6	6	3	5	9	18	27	20
<i>Legionella</i>	12	20	54	39	8	53	1	2	1	7
<i>Nocardia</i>	7	82	34	25	23	129	9	28	15	5
Total	51	241	171	238	57	227	63	119	108	80

Supplementary Table S7: Operational Taxonomic Unit (OTU) of the beneficial fungal genera detected in pre-plantation soils amended with different composts

Genus	YC	YD	YK	YM	YV	YF
<i>Wallemia</i>	10929	15796	50705	21607	16016	31145
<i>Ascobolus</i>	478	1263	1118	199	19	988
<i>Aspergillus</i>	12991	14915	12432	2132	2551	9875
<i>Pichia</i>	15	53	422	16	15	138
<i>Microascus</i>	4579	13209	9989	4695	1840	7900
<i>Cephalotrichum</i>	7	37	3	3	1	1
<i>Coprinus</i>	1	46	46	5	0	8
<i>Mortierella</i>	343	196	187	17	43	42
<i>Emericellopsis</i>	1067	401	836	186	568	4755
<i>Arthrographis</i>	97	360	168	11	5	23
<i>Gymnoascus</i>	2078	13	465	239	76	3001
<i>Thermoascus</i>	121	79	867	1275	208	1457
<i>Scedosporium</i>	62	323	686	72	3	221
<i>Geotrichum</i>	18	357	183	12	4	73
<i>Chaetomium</i>	312	212	16	6	2	143
<i>Trichoderma</i>	35	27	91	3	14	34
<i>Mycothermus</i>	58	4	287	2	263	2
<i>Kernia</i>	1009	11	196	4	5	4
<i>Ulospora</i>	0	0	0	0	0	0
<i>Trichosporon</i>	163	511	247	6	8	55
TOTAL OTUs	34363	47813	78944	30490	21641	59865

Supplementary Table S8: Operational Taxonomic Unit (OTU) of the beneficial fungal genera detected in post-harvest soils amended with different composts

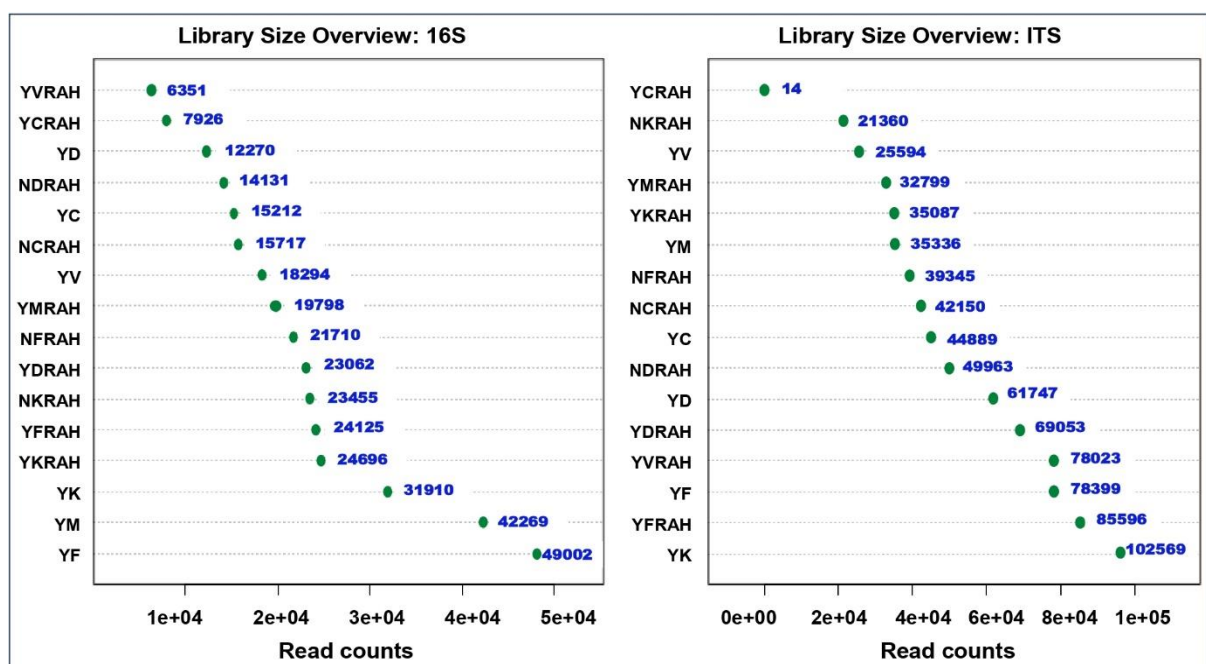
Genus	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
<i>Wallemia</i>	2	28191	12512	13313	24685	23382	25535	18917	9498	28955
<i>Ascobolus</i>	2	11298	4587	8015	5423	14412	1	629	4	1005
<i>Aspergillus</i>	6	6341	1048	1812	7224	17777	644	4960	537	414
<i>Pichia</i>	0	2513	699	84	493	176	70	1524	442	40
<i>Microascus</i>	1	1870	1496	1058	20675	132	4	6	97	4
<i>Cephalotrichum</i>	0	1596	40	5	383	69	1	3	4	2
<i>Coprinus</i>	0	1182	1184	4112	6	31	203	1396	1309	62
<i>Mortierella</i>	0	820	876	89	2830	697	584	148	73	176
<i>Emericellopsis</i>	0	326	229	181	744	915	0	5	1	0
<i>Arthrographis</i>	0	315	1964	148	101	55	55	1440	194	45
<i>Gymnoascus</i>	0	72	32	69	74	67	11	25	31	1
<i>Thermoascus</i>	0	1	1	3	0	0	0	3	0	0
<i>Scedosporium</i>	0	128	605	202	41	212	4	7	108	1
<i>Geotrichum</i>	0	63	52	2	55	458	1585	394	175	368
<i>Chaetomium</i>	0	22	22	1	172	37	29	725	9	2
<i>Trichoderma</i>	0	37	30	2	16	12	19	126	34	11
<i>Mycothermus</i>	0	167	195	3	1040	12	345	86	169	2
<i>Kernia</i>	0	2790	199	10	190	10	243	33	571	52
<i>Ulospora</i>	0	0	0	0	0	0	7378	7015	103	3675
<i>Trichosporon</i>	0	25	26	1	7	9	1	4	17	0
TOTAL OTUs	11	57757	25797	29110	64159	58463	36712	37446	13376	34815

Supplementary Table S9: Operational Taxonomic Unit (OTU) of the pathogenic fungal genera detected in the pre-plantation soils amended with different composts

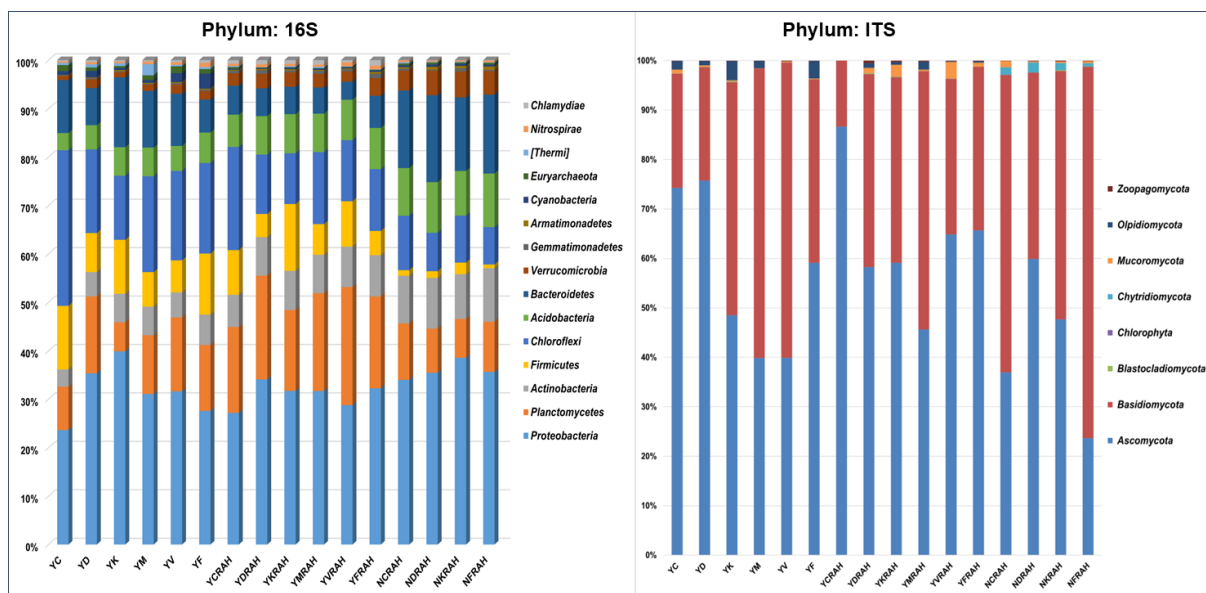
Genus	YC	YD	YK	YM	YV	YF
<i>Fusarium</i>	4488	3538	1670	994	517	3102
<i>Olpidium</i>	841	654	4243	551	3	3006
<i>Colletotrichum</i>	11	10	3	0	18	13
<i>Pyrenochaeta</i>	0	1355	1	0	0	1
<i>Penicillium</i>	1519	1614	964	346	798	3611
<i>Acremonium</i>	1113	1328	657	937	843	3303
<i>Alternaria</i>	487	462	574	135	136	711
<i>Cladosporium</i>	212	616	397	175	405	456
<i>Rhizoctonia</i>	0	2	14	1	4	8
<i>Verticillium</i>	33	498	68	21	52	97
<i>Scopulariopsis</i>	18	132	9685	243	10	90
TOTAL	8722	10209	18276	3403	2786	14398

Supplementary Table S10: Operational Taxonomic Unit (OTU) of the pathogenic fungal genera detected in the soils amended with different composts

Genus	YCR AH	YDR AH	YKR AH	YMR AH	YVR AH	YFR AH	NCR AH	NDR AH	NKR AH	NFR AH
<i>Fusarium</i>	0	2405	1940	1243	3572	2230	967	532	1608	843
<i>Olpidium</i>	0	719	202	558	110	214	0	1	0	0
<i>Colletotrichum</i>	0	267	208	1	197	383	1	13	3	0
<i>Pyrenochaeta</i>	0	234	25	13	66	48	2	27	811	2
<i>Penicillium</i>	0	191	84	88	581	166	60	128	156	112
<i>Acremonium</i>	0	41	69	53	191	51	24	23	188	37
<i>Alternaria</i>	0	14	5	56	9	16	40	33	27	16
<i>Cladosporium</i>	1	43	52	4	187	118	14	141	26	7
<i>Rhizoctonia</i>	0	3	2	16	243	170	3	2	0	14
<i>Verticillium</i>	1	149	104	18	137	109	1	12	21	0
<i>Scopulariopsis</i>	0	5	977	30	66	11	12	1	368	4
Total OTUs	2	4071	3668	2080	5359	3516	1124	913	3208	1035



Supplementary Fig. S1: The library size overview of the 16S and ITS metagenomics of the soil samples with different compost amendments



Supplementary Fig. S2: The prominent bacterial and fungal phyla identified in the soil were amended with different composts.