

Soybean plants modify metal oxide nanoparticle effects on soil bacterial communities

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Number figures: 2

Number of tables: 3

Materials and Methods

Polymerase Chain Reaction (PCR) and T-RFLP. Negative controls, containing all PCR components except DNA templates, were included to test for contamination. For each sample, PCR products from duplicate reactions were pooled to reduce random PCR bias. The size and quality of PCR products were verified by 1.2% agarose-gel electrophoresis (Flashgel DNA system; Lonza, Allendale, NJ, USA). PCR products were purified using the QIAquick PCR Purification Kit (Qiagen, Valencia, CA, USA), and quantified using the Quant-iT dsDNA Assay Kit, Broad Range (Invitrogen, Eugene, OR, USA), according to the manufacturer's instructions.

The purified PCR products (600 ng) were digested at 37°C for 16 h using the *HhaI* restriction enzyme (New England BioLabs, Ipswich, MA, USA), deactivated at 65°C for 20 min, and purified again using the QIAquick Nucleotide Removal Kit (Qiagen, Valencia, CA, USA), according to the manufacturer's instructions.

PhyloChip Analysis and Data Preprocessing. To calculate the overall fluorescence intensity of each probe set that represents a specific OTU, the central nine pixels of individual probes were ranked by intensity, and the 75th percentile intensity values were used. Probe intensities were background-subtracted, i.e. scaled to the quantitative standards,⁴ and collected as integer values ranging from 0 to 65,536 (2^{16}). Fluorescence intensities of individual probes within each probe set were averaged after discarding the highest and lowest values, and the mean was \log_2 transformed and rounded to decimal numbers ranging from 0 to 16. For compatibility with the statistical analysis, the mean was multiplied by 1000 then rounded to the nearest integer, allowing a range of 0 to 16,000. The mean was referred to as the hybridization score of a specific OTU.⁴

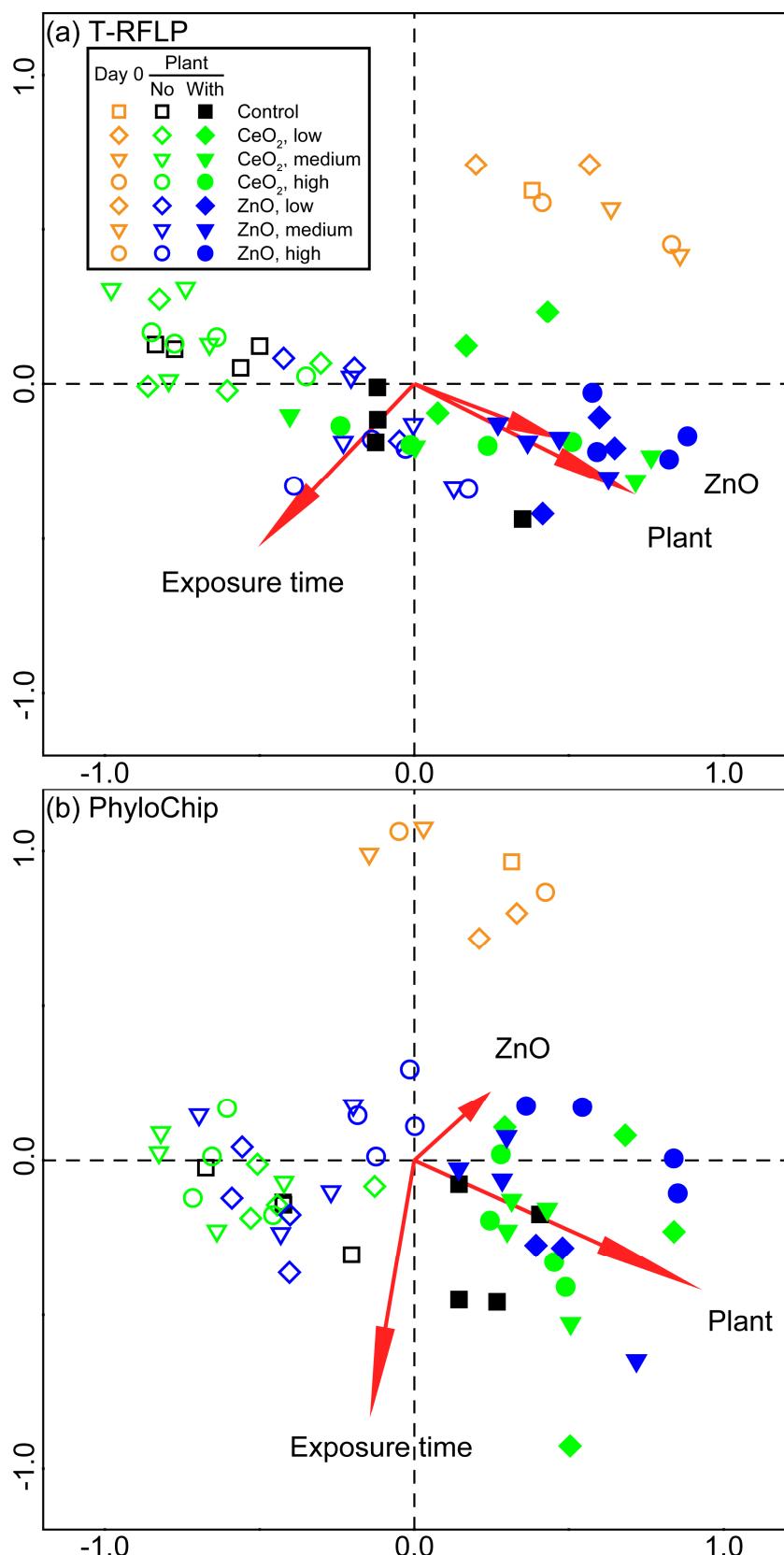


Figure S1. Distance-based redundancy analysis (dbRDA) to illustrate the effects of different environmental variables (plant, ENP dose, and exposure time) on soil bacterial communities. The x- and y-axis represent the first and the second ordination axis, respectively. Soil bacterial communities were independently characterized by both terminal restriction fragment length polymorphism (T-RFLP, a) and PhyloChip analysis (b). Control: ENP-free control; Low: low dose of nano-CeO₂ (0.1 g kg⁻¹) or nano-ZnO (0.05 g kg⁻¹); Medium: medium dose of nano-CeO₂ (0.5 g kg⁻¹) or nano-ZnO (0.1 g kg⁻¹); High: high dose of nano-CeO₂ (1.0 g kg⁻¹) or nano-ZnO (0.5 g kg⁻¹). The red arrows point to microbial communities whose treatments were significantly related to the variable (arrow label); the lengths of the arrows indicate the variables' effects magnitudes on soil microbial community composition.

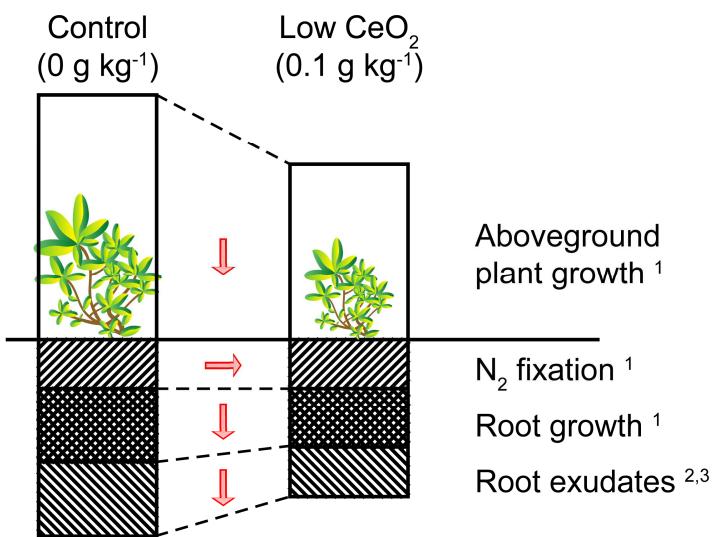


Figure S2. Conceptual illustration of the possible effects of 0.1 g kg^{-1} nano- CeO_2 on N_2 fixation, aboveground and belowground soybean biomass, and root exudates. In a previous paper from this study regarding plant growth and N_2 fixation potential, Priester et al. showed that, compared to the ENP-free control, 0.1 g kg^{-1} nano- CeO_2 did not alter N_2 fixation, but stunted aboveground and belowground plant growth.¹ Although not quantified, plant root exudates are likely to have been reduced due to stunted plant growth when plants were grown in the presence of 0.1 g kg^{-1} nano- CeO_2 , since it has been reported in other studies that root exudates positively correlate with root and shoot biomass.^{2,3} Our prior interpretation regarding N_2 fixation at this low nano- CeO_2 dose was that the plants preferentially allocated photosynthate to root nodules so that the N_2 fixation apparatus was functional.¹ Decreased root growth and aboveground plant biomass would support the interpretation, and would support that root exudates also would have been decreased. With less, or even compositionally different, bioavailable plant-derived C compounds entering planted soils, it is logical that bacterial communities in the low nano- CeO_2 treatment would vary from the communities in planted control soils.

Table S1. The number of independent DNA extracts, T-RFLP profiles, and PhyloChip runs.

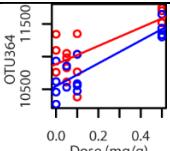
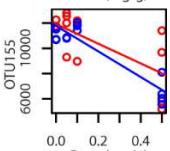
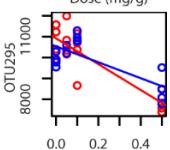
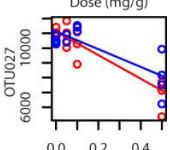
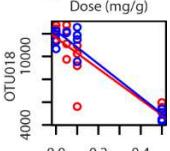
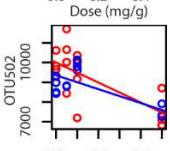
Dose (g kg ⁻¹)	Control	CeO ₂			ZnO		
	0	0.1	0.5	1	0.05	0.1	0.5
DNA extracts*							
Day 0	1	1	1	1	1	1	1
No plant	4	4	4	4	4	4	4
With plant	4	4	4	4	3	4	4
T-RFLP profiles **							
Day 0	1	1	1	1	1	1	1
No plant	4	4	4	4	3	4	4
With plant	4	3	4	4	3	4	4
PhyloChip runs ***							
Day 0	1	1	1	1	1	1	1
No plant	4	4	4	4	4	4	4
With plant	4	4	4	4	2	4	4

*One replicate of the low dose nano-ZnO treatment in planted soils was not included in DNA extraction and the following T-RFLP and PhyloChip analyses, since the plant died after transplantation.

**Two T-RFLP outliers, one from the low nano-ZnO treatment in unplanted soils and another from the low nano-CeO₂ treatment in planted soils, were not included in the statistical analyses.

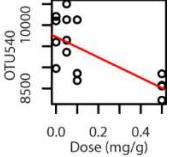
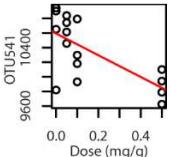
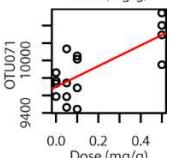
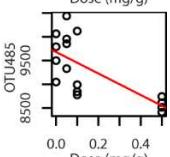
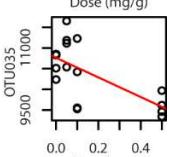
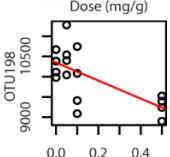
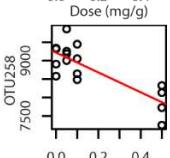
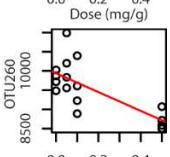
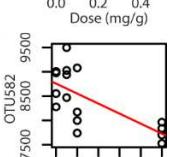
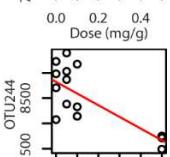
***One PhyloChip outlier from the low nano-ZnO treatment in planted soils was not included in the statistical analyses.

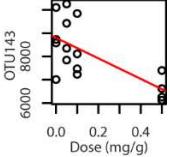
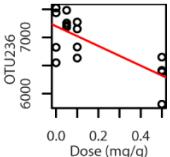
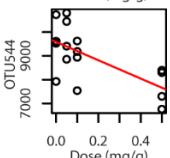
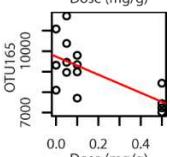
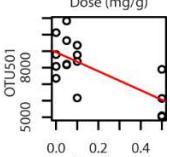
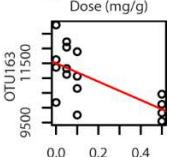
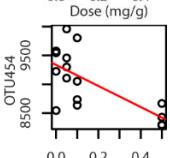
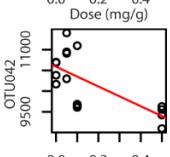
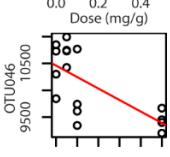
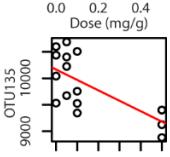
Table S2. The bacterial taxa (103 of 514 classified OTUs) identified as sensitive to nano-ZnO exposure through linear regression ($Y = aX + b$). The hybridization score of bacterial OTU determined by PhyloChip was used as the dependent variable, and the exposure dose of nano-ZnO was the independent variable. The red lines represent unplanted treatments, and the blue lines represent planted treatments. Because the OTU is a lower level than the genus, and can be further grouped to higher taxonomic levels (kingdom; phylum; class; order; family; genus), the same genus may contain different OTUs, with some increasing and others decreasing, in the presence of nano-ZnO.

OTU	Plant	Linear regression: $Y = aX + b$					Taxonomic affiliation (kingdom; phylum; class; order; family; genus)
		a	b	R^2	Adjusted P	Graph	
otu364	No	1402	10883	0.53	0.024		<i>Bacteria; Acidobacteria; iiiI-8; DS-18; unclassified; unclassified</i>
	With	1749	10546	0.76	0.003		
otu155	No	-7799	11923	0.48	0.035		<i>Bacteria; Cyanobacteria; Oscillatoriophycideae; Chroococcales; Synechococcaceae; Synechococcus</i>
	With	-10147	11782	0.84	0.001		
otu295	No	-6180	10916	0.74	0.001		<i>Bacteria; Cyanobacteria; Oscillatoriophycideae; Chroococcales; Xenococcaceae; Chroococcidiopsis</i>
	With	-3816	10535	0.56	0.028		
otu027	No	-7976	11121	0.79	0.001		<i>Bacteria; Cyanobacteria; Oscillatoriophycideae; Chroococcales; Xenococcaceae; Xenococcus</i>
	With	-5990	11124	0.64	0.018		
otu018	No	-13516	11635	0.77	0.001		<i>Bacteria; Cyanobacteria; Oscillatoriophycideae; Oscillatoriales; Phormidiae; Phormidium</i>
	With	-14543	12256	0.92	0.000		
otu502	No	-5067	10002	0.50	0.029		<i>Bacteria; Cyanobacteria; Oscillatoriophycideae; Oscillatoriales; Phormidiae; Phormidium</i>
	With	-3519	9354	0.56	0.029		

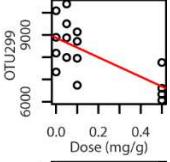
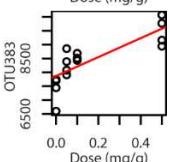
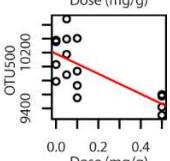
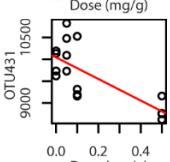
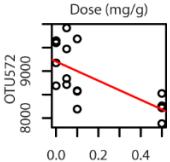
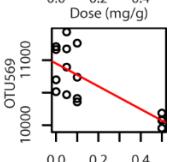
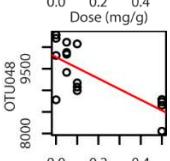
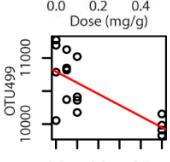
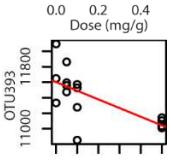
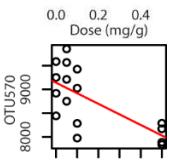
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	With	-4552	10538	0.57	0.027		
otu012	No	-1078	11799	0.55	0.021		Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;Gemmatimonas
	With	-1814	11435	0.81	0.001		
otu433	No	-1009	11659	0.56	0.019		Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;unclassified
	With	-1501	11472	0.73	0.005		
otu099	No	-3060	10847	0.69	0.004		Bacteria;OP11;OP11-1;GN01;unclassified;unclassified
	With	-3245	11192	0.64	0.017		
otu403	No	-2017	11818	0.62	0.010		Bacteria;Planctomycetes;agg27;CL500-15;unclassified;unclassified
	With	-1927	11828	0.53	0.035		
otu475	No	-1556	10158	0.46	0.037		Bacteria;Planctomycetes;Kueneniae;Kueneniales;Scalinduaceae;Candidatus_Scalindua
	With	-2955	10400	0.89	0.000		
otu397	No	-1467	9316	0.53	0.024		Bacteria;Planctomycetes;Planctomyceta;Planctomycetales;Planctomycetaceae;A17
	With	-1971	9209	0.73	0.005		
otu358	No	-1849	8947	0.51	0.028		Bacteria;Planctomycetes;Planctomyceta;Planctomycetales;Planctomycetaceae;unclassified
	With	-1563	9328	0.58	0.025		
otu151	No	-3016	10666	0.57	0.018		Bacteria;Planctomycetes;Planctomyceta;unclassified;unclassified;unclassified
	With	-3025	10675	0.72	0.006		
otu472	No	-1624	10534	0.55	0.019		Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Acetobacteraceae;unclassified
	With	-2575	10594	0.82	0.001		

otu462	No	-4786	8771	0.87	0.000		Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;unclassified;unclassified
	With	-4624	8246	0.85	0.000		
otu147	No	-1413	12179	0.50	0.029		Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Azotobacter
	With	-1643	12106	0.69	0.008		
otu550	No	-1816	9848	0.43	0.048		Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Azotobacter
	With	-1289	9924	0.48	0.049		
otu474	No	-1483	13130	0.82	0.000		Bacteria;Synergistetes;Synergistia;Synergistales;Synergistaceae;vadinCA02
	With	-1298	12825	0.79	0.002		
otu083	No	-2264	10162	0.58	0.018		Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;unclassified
	With	-2272	10552	0.78	0.002		
otu084	No	-1953	11840	0.73	0.002		Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;unclassified
	With	-2290	11975	0.88	0.000		
otu380	No	-2462	8401	0.56	0.019		Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;unclassified
	With	-2341	8688	0.79	0.002		
otu255	No	-1537	10374	0.53	0.023		Bacteria;Acidobacteria;Acidobacteriia;Acidobacteriales;Acidobacteriaceae;unclassified
otu256	No	-2173	9718	0.56	0.019		Bacteria;Acidobacteria;Acidobacteriia;Acidobacteriales;Acidobacteriaceae;unclassified
otu537	No	-1452	10989	0.46	0.037		Bacteria;Acidobacteria;Acidobacteriia;Acidobacteriales;Acidobacteriaceae;unclassified

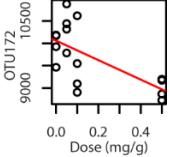
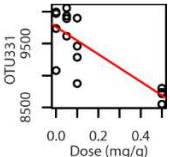
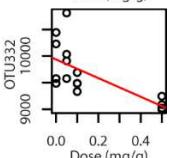
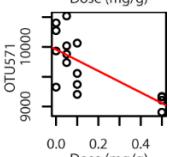
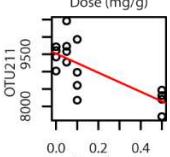
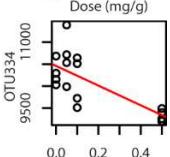
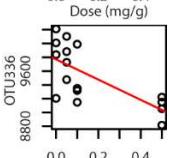
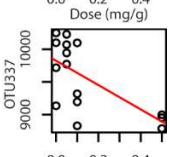
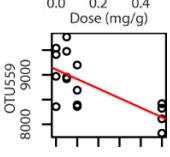
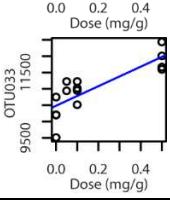
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otu071	No	1186	9699	0.54	0.021		Bacteria; Acidobacteria; Solibacteres; Solibacterales; Solibacteraceae; Candidatus_Solibacter
otu485	No	-2258	9679	0.50	0.029		Bacteria; Actinobacteria; Actinobacteria; Actinomycetales; Micrococcaceae; Arthrobacter
otu035	No	-2367	10763	0.44	0.047		Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified
otu198	No	-2217	10348	0.45	0.039		Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified
otu258	No	-2688	9218	0.65	0.007		Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified
otu260	No	-2444	9939	0.52	0.025		Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified
otu582	No	-2060	8758	0.48	0.034		Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified
otu244	No	-2314	8824	0.59	0.017		Bacteria; Bacteroidetes; Sphingobacteria; Sphingobacteriales; unclassified; unclassified

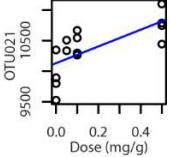
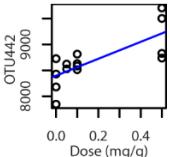
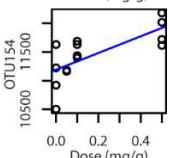
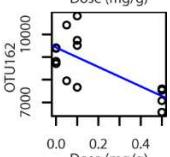
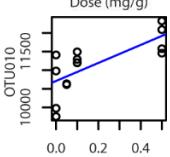
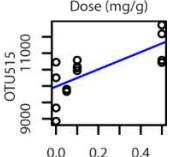
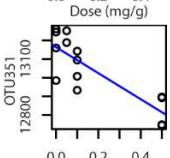
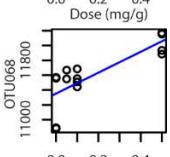
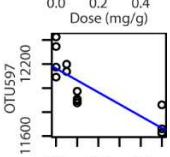
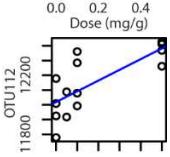
otu143	No	-4403	8802	0.46	0.038		Bacteria;Cyanobacteria;Chloroplast; Streptophyta;unclassified;unclassified
otu236	No	-1752	7199	0.55	0.019		Bacteria;Cyanobacteria;Chloroplast; Streptophyta;unclassified;unclassified
otu544	No	-3850	9588	0.43	0.049		Bacteria;Cyanobacteria;Chloroplast; Streptophyta;unclassified;unclassified
otu165	No	-4414	9737	0.45	0.039		Bacteria;Cyanobacteria;Oscillatoriophycideae;Chroococcales;Xenococcaceae;Chroococcidiopsis
otu501	No	-5761	8939	0.48	0.034		Bacteria;Cyanobacteria;Oscillatoriophycideae;unclassified;unclassified;unclassified
otu163	No	-3113	11505	0.43	0.049		Bacteria;Cyanobacteria;Synechococophycideae;Pseudanabaenales;Pseudanabaenaceae;Leptolyngbya
otu454	No	-1824	9335	0.48	0.035		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;Clostridium
otu042	No	-2386	10589	0.48	0.034		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu046	No	-2138	10460	0.47	0.036		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu135	No	-1966	10166	0.50	0.030		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified

otu227	No	-1826	8754	0.43	0.049		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu230	No	-2298	9907	0.57	0.018		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu231	No	-2112	10227	0.53	0.025		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu304	No	-1829	8497	0.44	0.043		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu333	No	-1693	11115	0.57	0.018		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu452	No	-1723	10337	0.57	0.018		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu455	No	-1682	10808	0.47	0.036		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu478	No	-1701	10673	0.53	0.023		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu141	No	-3044	10976	0.48	0.035		Bacteria;Firmicutes;Clostridia;Clostridiales;Ruminococcaceae;unclassified
otu459	No	-2174	9781	0.49	0.031		Bacteria;Firmicutes;Clostridia;Clostridiales;Ruminococcaceae;unclassified

otu299	No	-4366	8868	0.46	0.037		Bacteria; Firmicutes; Clostridia; Clostridiales; unclassified; unclassified
otu383	No	3413	7867	0.65	0.007		Bacteria; Gemmatimonadetes; Gemmatimonadetes; Gemmatimonadales; Gemmatimonadaceae; Gemmatimonas
otu500	No	-1440	10185	0.51	0.028		Bacteria; Gemmatimonadetes; Gemmatimonadetes; Gemmatimonadales; Gemmatimonadaceae; unclassified
otu431	No	-2465	10043	0.54	0.021		Bacteria; Planctomycetes; Planctomyceta; Planctomycetales; Planctomycetaceae; unclassified
otu572	No	-2038	9204	0.44	0.045		Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Rhizobiaceae; Azobacterium
otu569	No	-1756	10948	0.56	0.019		Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Rhizobiaceae; Ensifer
otu048	No	-2466	9767	0.55	0.019		Bacteria; Proteobacteria; Alphaproteobacteria; Rhodospirillales; Rhodospirillaceae; unclassified
otu499	No	-1687	10794	0.50	0.029		Bacteria; Proteobacteria; Alphaproteobacteria; Rhodospirillales; Rhodospirillaceae; unclassified
otu393	No	-1117	11602	0.46	0.037		Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales; Sphingomonadaceae; Blastomonas
otu570	No	-2226	9143	0.47	0.037		Bacteria; Proteobacteria; Deltaproteobacteria; Myxococcales; unclassified; unclassified

otu335	No	-1557	10666	0.59	0.017		Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Desulfovibrionaceae;unclassified
otu043	No	-2099	10545	0.48	0.035		Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Syntrophobacteraceae;unclassified
otu209	No	-2570	10892	0.56	0.019		Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Syntrophobacteraceae;unclassified
otu212	No	-2164	9779	0.43	0.049		Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;unclassified;unclassified
otu339	No	-2090	9083	0.47	0.037		Bacteria;Proteobacteria;Deltaproteobacteria;unclassified;unclassified;unclassified
otu491	No	-1997	9807	0.51	0.027		Bacteria;Proteobacteria;Gammaproteobacteria;Alteromonadales;unclassified;unclassified
otu241	No	-2266	9075	0.46	0.038		Bacteria;Proteobacteria;Gammaproteobacteria;Chromatiales;Chromatiaceae;unclassified
otu190	No	-1970	10106	0.44	0.043		Bacteria;Proteobacteria;Gammaproteobacteria;Enterobacterales;Enterobacteriaceae;unclassified
otu490	No	-2269	9968	0.46	0.037		Bacteria;Proteobacteria;Gammaproteobacteria;Oceanospirillales;Halomonadaceae;unclassified
otu038	No	-2487	10105	0.49	0.032		Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas

otu172	No	-2180	10060	0.43	0.049		Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified
otu331	No	-2142	9761	0.65	0.007		Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified
otu332	No	-1753	9936	0.48	0.035		Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified
otu571	No	-1797	9956	0.52	0.025		Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;unclassified
otu211	No	-2751	9521	0.54	0.022		Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu334	No	-2238	10459	0.53	0.025		Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu336	No	-1466	9769	0.48	0.034		Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu337	No	-1862	9824	0.48	0.035		Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu559	No	-1930	9109	0.48	0.035		Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu033	With	2986	10484	0.69	0.009		Bacteria;Acidobacteriia;Acidobacteriales;Acidobacteriaceae;unclassified

otu021	With	1367	10130	0.49	0.045		Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Microbacterium
otu442	With	1631	8397	0.56	0.029		Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Nocardiaceae;Rhodococcus
otu154	With	1458	11190	0.52	0.037		Bacteria;Cyanobacteria;Oscillatoriophycideae;Chroococcales;unclassified;unclassified
otu162	With	-4286	9422	0.51	0.038		Bacteria;Cyanobacteria;Synechococcophycideae;Pseudanabaenales;Pseudanabaenaceae;Leptolyngbya
otu010	With	2416	10712	0.53	0.036		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu515	With	2629	9981	0.52	0.037		Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu351	With	-697	13163	0.70	0.007		Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;unclassified
otu068	With	1406	11352	0.62	0.018		Bacteria;Planctomycetes;Planctomycetes;Planctomycetales;Planctomycetaceae;Planctomyces
otu597	With	-994	12163	0.70	0.007		Bacteria;Planctomycetes;Planctomycetes;Planctomycetales;Planctomycetaceae;unclassified
otu112	With	726	12019	0.56	0.029		Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Rhizobium

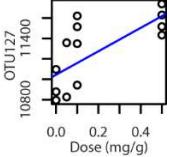
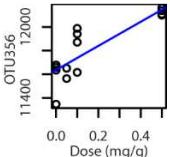
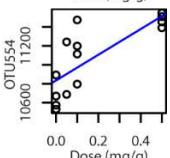
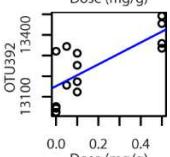
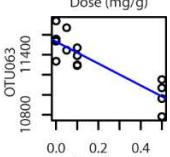
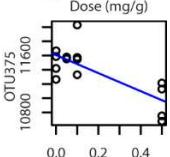
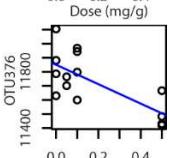
otu127	With	1146	11045	0.50	0.040		Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingomonas
otu356	With	1018	11637	0.72	0.006		Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingomonas
otu554	With	1354	10835	0.60	0.021		Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;unclassified
otu392	With	529	13151	0.56	0.029		Bacteria;Proteobacteria;Betaproteobacteria;Methylophilales;Methylophilaceae;Methylobacillus
otu063	With	-1094	11531	0.76	0.003		Bacteria;Proteobacteria;Betaproteobacteria;unclassified;unclassified;unclassified
otu375	With	-1267	11607	0.57	0.027		Bacteria;WS3;PRR-12;Sediment-1;PRR-10;unclassified
otu376	With	-690	11851	0.52	0.037		Bacteria;WS3;PRR-12;Sediment-1;PRR-10;unclassified

Table S3. The bacterial OTUs that differed in the presence and absence of soybean plants. The hybridization scores of bacterial OTUs determined by PhyloChip were compared using Student's *t* test, coupled with Benjamini-Hochberg correction (adjusted *P* < 0.05).

OTU	No plant		With plant		Adjusted <i>P</i>	Sensitive to ZnO	Taxonomic affiliation (kingdom; phylum; class; order; family; genus)
	Mean	S.D.	Mean	S.D.			
otu012	11739	291	11195	386	0.000	Yes	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;Gemmatimonas</i>
otu474	13001	294	12664	258	0.000	Yes	<i>Bacteria;Synergistetes;Synergistia;Synergistales;Synergistaceae;vadinCA02</i>
otu364	11142	328	10729	369	0.000	Yes	<i>Bacteria;Acidobacteria;iii1-8;DS-18;unclassified;unclassified</i>
otu433	11598	262	11369	346	0.019	Yes	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;unclassified</i>
otu462	8347	905	7730	868	0.030	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;unclassified;unclassified</i>
otu358	8877	553	9208	432	0.039	Yes	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;unclassified</i>
otu331	9554	470	8741	276	0.000	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified</i>
otu500	10086	378	9455	245	0.000	Yes	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;unclassified</i>
otu491	9707	523	8857	323	0.000	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Alteromonadales;unclassified;unclassified</i>
otu244	8671	563	7804	313	0.000	Yes	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;unclassified;unclassified</i>
otu230	9729	545	8882	329	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu333	11052	433	10398	247	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu143	8160	1104	11098	2024	0.000	Yes	<i>Bacteria;Cyanobacteria;Chloroplast;Str</i>

							<i>eptophyta;unclassified;unclassified</i>
otu478	10586	438	9919	310	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu332	9873	486	9169	305	0.000	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified</i>
otu256	9534	525	8797	319	0.000	Yes	<i>Bacteria;Acidobacteria;Acidobacteriia;Acidobacterales;Acidobacteriaceae;unclassified</i>
otu452	10218	423	9586	319	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu258	8952	562	8219	252	0.000	Yes	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>
otu236	7026	420	9262	1899	0.000	Yes	<i>Bacteria;Cyanobacteria;Chloroplast;Str eptophyta;unclassified;unclassified</i>
otu569	10858	436	10299	228	0.000	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Ensifer</i>
otu336	9710	406	9189	289	0.000	Yes	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified</i>
otu570	8973	567	8285	340	0.000	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;unclassified;unclassified</i>
otu048	9610	614	8859	383	0.000	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Rhodospirillaceae;unclassified</i>
otu541	10536	412	10025	272	0.000	Yes	<i>Bacteria;Acidobacteria;Acidobacteriia;Acidobacterales;Acidobacteriaceae;unclassified</i>
otu454	9228	490	8615	398	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;Clostridium</i>
otu135	10054	523	9423	396	0.000	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu571	9839	447	9338	311	0.000	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;unclassified</i>
otu260	9707	583	9029	455	0.000	Yes	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>
otu339	8892	537	8277	416	0.000	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;unclassified;unclassified;unclassified</i>

otu537	10925	406	10509	210	0.000	Yes	<i>Bacteria; Acidobacteria; Acidobacteriia; Acidobacteriales; Acidobacteriaceae; unclassified</i>
otu335	10585	384	10176	253	0.000	Yes	<i>Bacteria; Proteobacteria; Deltaproteobacteria; Syntrophobacterales; Desulfobacte raceae; unclassified</i>
otu190	9971	527	9421	359	0.000	Yes	<i>Bacteria; Proteobacteria; Gammaproteobacteria; Enterobacteriales; Enterobacteri aceae; unclassified</i>
otu540	9563	633	8904	452	0.000	Yes	<i>Bacteria; Acidobacteria; Acidobacteriia; Acidobacteriales; Acidobacteriaceae; unclassified</i>
otu231	10086	531	9569	299	0.000	Yes	<i>Bacteria; Firmicutes; Clostridia; Clostridiales; Lachnospiraceae; unclassified</i>
otu299	8271	1101	7148	767	0.000	Yes	<i>Bacteria; Firmicutes; Clostridia; Clostridiales; unclassified; unclassified</i>
otu046	10273	553	9732	377	0.000	Yes	<i>Bacteria; Firmicutes; Clostridia; Clostridiales; Lachnospiraceae; unclassified</i>
otu255	10343	429	9948	251	0.001	Yes	<i>Bacteria; Acidobacteria; Acidobacteriia; Acidobacteriales; Acidobacteriaceae; unclassified</i>
otu485	9532	587	8995	369	0.001	Yes	<i>Bacteria; Actinobacteria; Actinobacteria; Actinomycetales; Micrococcaceae; Arthrobacter</i>
otu582	8593	537	7883	768	0.001	Yes	<i>Bacteria; Bacteroidetes; Bacteroidia; Bacteroidales; RikenellaceaeII; unclassified</i>
otu304	8423	527	7694	818	0.001	Yes	<i>Bacteria; Firmicutes; Clostridia; Clostridiales; Lachnospiraceae; unclassified</i>
otu165	9180	1123	8247	708	0.002	Yes	<i>Bacteria; Cyanobacteria; Oscillatoriophy cidae; Chroococcales; Xenococcaceae; Chroococcidiopsis</i>
otu544	9111	983	8320	702	0.004	Yes	<i>Bacteria; Cyanobacteria; Chloroplast; Str eptophyta; unclassified; unclassified</i>
otu559	8923	492	8181	1043	0.004	Yes	<i>Bacteria; Proteobacteria; unclassified; unclassified; unclassified; unclassified</i>
otu241	8867	595	8402	391	0.004	Yes	<i>Bacteria; Proteobacteria; Gammaproteobacteria; Chromatiales; Chromatiaceae; unclassified</i>
otu337	9654	478	9293	281	0.004	Yes	<i>Bacteria; Proteobacteria; unclassified; unclassified; unclassified; unclassified</i>
otu334	10224	530	9850	272	0.006	Yes	<i>Bacteria; Proteobacteria; unclassified; un</i>

							<i>classified;unclassified;unclassified</i>
otu393	11474	318	11717	230	0.006	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Blastomonas</i>
otu499	10741	467	10408	281	0.008	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Rhodospirillaceae;unclassified</i>
otu431	9810	575	9393	384	0.008	Yes	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;unclassified</i>
otu038	9853	613	9135	1065	0.009	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu172	9849	586	9422	450	0.011	Yes	<i>Bacteria;Proteobacteria;Gammaproteobacteria;unclassified;unclassified;unclassified</i>
otu227	8628	502	8060	916	0.016	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu211	9177	662	8760	408	0.019	Yes	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified</i>
otu572	9062	558	8710	345	0.019	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Agrobacterium</i>
otu459	9557	541	9226	343	0.024	Yes	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Ruminococcaceae;unclassified</i>
otu035	10507	616	10125	447	0.028	Yes	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>
otu209	10598	585	10237	442	0.031	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Syntrophobacteraceae;unclassified</i>
otu212	9539	570	9198	412	0.034	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;unclassified;unclassified</i>
otu043	10339	523	10043	361	0.042	Yes	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Syntrophobacteraceae;unclassified</i>
otu112	11569	240	12109	257	0.000	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Rhizobium</i>
otu597	12501	227	12077	234	0.000	Yes	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;unclassified</i>

otu392	12912	203	13249	173	0.000	Yes	<i>Bacteria;Proteobacteria;Betaproteobacteria;Methylophilales;Methylophilaceae;Methylobacillus</i>
otu356	11266	271	11721	255	0.000	Yes	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingomonas</i>
otu351	13293	118	13063	162	0.000	Yes	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;unclassified</i>
otu376	11991	233	11780	222	0.004	Yes	<i>Bacteria;WS3;PRR-12;Sediment-1;PRR-10;unclassified</i>
otu375	11654	232	11396	325	0.004	Yes	<i>Bacteria;WS3;PRR-12;Sediment-1;PRR-10;unclassified</i>
otu021	9851	438	10223	385	0.005	Yes	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Micrombacterium</i>
otu033	10472	394	10847	646	0.028	Yes	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacterales;Acidobacteriaceae;unclassified</i>
otu149	10843	283	12839	557	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;Burkholderiaceae;Burkholderia</i>
otu102	3996	443	9067	1735	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacterales;Flexibacteraceae;Spirosoma</i>
otu017	4189	451	9372	1808	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacterales;Flexibacteraceae;Emticia</i>
otu504	9762	350	11394	464	0.000	No	<i>Bacteria;TM7;TM7-3;EW055;unclassified;unclassified</i>
otu496	10261	259	11379	335	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;unclassified;unclassified;unclassified</i>
otu074	7020	690	11098	1406	0.000	No	<i>Bacteria;TM7;TM7-3;EW055;unclassified;unclassified</i>
otu116	10756	324	12341	529	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Micrococcaceae;unclassified</i>
otu156	10296	429	11922	476	0.000	No	<i>Bacteria;TM7;TM7-3;EW055;unclassified;unclassified</i>
otu245	7740	394	10174	930	0.000	No	<i>Bacteria;TM7;TM7-3;EW055;unclassified;unclassified</i>

otu052	12485	207	11780	208	0.000	No	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>
otu013	4990	457	10134	2191	0.000	No	<i>Bacteria;Cyanobacteria;Chloroplast;Strptophyta;unclassified;unclassified</i>
otu005	7873	453	10559	1104	0.000	No	<i>Bacteria;TM7;TM7-3;I025;A29;unclassified</i>
otu169	8188	593	10339	818	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;Comamonadaceae;unclassified</i>
otu108	3939	919	8114	1771	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Methylophilales;Methylophilaceae;Methylophilus</i>
otu443	5199	572	8503	1509	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu058	8485	320	10138	806	0.000	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Bdellovibrionales;Bacteriovoracaceae;unclassified</i>
otu024	8320	405	9725	627	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;Prosthecobacter</i>
otu081	12254	315	11574	215	0.000	No	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;unclassified;unclassified;unclassified</i>
otu552	9616	326	10419	322	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Methylophilales;Methylophilaceae;Methylovorus</i>
otu434	10087	286	10780	284	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;unclassified</i>
otu107	8842	293	10155	722	0.000	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Bdellovibrionales;Bacteriovoracaceae;unclassified</i>
otu360	6745	586	8477	839	0.000	No	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;Planctomyces</i>
otu503	10042	467	11187	541	0.000	No	<i>Bacteria;TM7;TM7-3;EW055;unclassified;unclassified</i>
otu374	10251	302	9518	344	0.000	No	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;unclassified;unclassified;unclassified</i>
otu080	12515	199	12075	199	0.000	No	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;unclassified;unclassified;unclassified</i>

							<i>ssified</i>
otu109	8356	895	10246	808	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Flexibacteraceae;Dyadobacter</i>
otu378	10754	234	11387	343	0.000	No	<i>Bacteria;TM7;TM7-1;unclassified;unclassified;unclassified</i>
otu087	11953	265	11316	323	0.000	No	<i>Bacteria;Gemmatimonadetes;Gemmatimonadetes;Gemmatimonadales;Gemmatimonadaceae;Gemmatimonas</i>
otu070	11004	244	10485	244	0.000	No	<i>Bacteria;Acidobacteria;Solibacteres;Solibacterales;Solibacteraceae;Candidatus_Solibacter</i>
otu114	8088	711	9614	743	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Shinella</i>
otu440	10151	296	10805	326	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Microbacterium</i>
otu562	10854	226	10379	240	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Rhodospirillaceae;unclassified</i>
otu399	11454	173	11820	186	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Agrococcus</i>
otu437	9946	313	10551	309	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;Luteolibacter</i>
otu069	8457	384	9498	672	0.000	No	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;Planctomyces</i>
otu119	10649	322	11415	469	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;Methylibiaceae;Methylibium</i>
otu014	7761	493	10430	1944	0.000	No	<i>Bacteria;Cyanobacteria;Chloroplast;Strptophyta;unclassified;unclassified</i>
otu050	9724	452	9002	273	0.000	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;unclassified;unclassified;unclassified</i>
otu427	8236	360	9139	591	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;Clostridium</i>
otu097	9777	375	10727	628	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Sphingobacteriaceae</i>

							<i>e;Pedobacter</i>
otu061	8973	406	10149	822	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Flexibacteraceae;unclassified</i>
otu589	7858	540	9467	1137	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Flexibacteraceae;unclassified</i>
otu253	10184	215	10516	139	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu020	11420	520	12256	395	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Pseudoxanthomonas</i>
otu309	12391	178	12080	184	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;unclassified;unclassified;unclassified</i>
otu098	6430	1032	8584	1460	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingobium</i>
otu264	10351	223	10712	200	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu416	11876	224	11527	185	0.000	No	<i>Bacteria;Chloroflexi;Dehalococcoidetes;TK17;S085;unclassified</i>
otu471	10526	283	11099	402	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Acetobacteraceae;Roseomonas</i>
otu049	9590	522	8910	285	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu419	8602	507	9525	654	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu022	9250	753	10478	805	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Micromonobacterium</i>
otu398	11401	344	12044	472	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Microbacteriaceae;Agricoccus</i>
otu174	8824	381	9515	504	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;unclassified;unclassified</i>
otu152	8996	578	10065	794	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Kiloniellales;Kiloniellaceae;unclassified</i>

otu051	10276	514	9619	302	0.000	No	Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu484	9887	490	9273	278	0.000	No	Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;unclassified;unclassified
otu234	9752	252	10109	217	0.000	No	Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu153	10349	387	11017	496	0.000	No	Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Kaistia
otu411	8253	400	8829	361	0.000	No	Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Sinobacteraceae;Nevskia
otu453	9338	584	8608	344	0.000	No	Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified
otu120	11117	595	10244	563	0.000	No	Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Lysobacter
otu381	11596	260	11206	263	0.000	No	Bacteria;Acidobacteria;PAUC37f;unclassified;unclassified;unclassified
otu175	10070	522	9429	308	0.000	No	Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified
otu267	13518	159	13741	148	0.000	No	Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas
otu408	8046	537	8813	537	0.000	No	Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;Terriblobus
otu268	10681	421	11216	321	0.000	No	Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified
otu466	8093	449	8843	601	0.000	No	Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified
otu497	10761	321	11232	346	0.000	No	Bacteria;Proteobacteria;Alphaproteobacteria;Rhodobacterales;Rhodobacteraceae;Paracoccus
otu519	10675	351	10246	249	0.000	No	Bacteria;Firmicutes;unclassified;unclassified;unclassified;unclassified
otu145	9454	583	10306	646	0.000	No	Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas
otu235	8219	418	8894	556	0.000	No	Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified

otu379	7208	820	8493	1042	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;unclassified</i>
otu412	9958	291	9559	306	0.000	No	<i>Bacteria;CD12;MB-B2-116;unclassified;unclassified;unclassified</i>
otu365	8570	452	9451	829	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;unclassified;unclassified</i>
otu082	9090	438	9764	588	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;Verrucomicrobiaceae;unclassified</i>
otu413	9221	303	9752	504	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Micrococcaceae;unclassified</i>
otu568	9587	497	9060	286	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;unclassified;unclassified</i>
otu355	11412	270	10959	424	0.000	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;Polyangiaceae;unclassified</i>
otu096	12262	243	11901	318	0.000	No	<i>Bacteria;SM2F11;unclassified;unclassified;unclassified</i>
otu377	11644	221	11367	212	0.000	No	<i>Bacteria;Planctomycetes;Planctomycea;Gemmatales;Isosphaeraceae;unclassified</i>
otu409	10410	350	10819	286	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Rhizobium</i>
otu498	11457	276	11149	199	0.000	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;unclassified;unclassified</i>
otu160	10246	493	9686	376	0.000	No	<i>Bacteria;Firmicutes;Bacilli;Bacillales;unclassified;unclassified</i>
otu085	10881	327	10491	291	0.000	No	<i>Bacteria;Acidobacteria;Chloracidobacteria;unclassified;unclassified;unclassified</i>
otu451	9647	619	9014	338	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Ruminococcaceae;unclassified</i>
otu495	12670	152	12426	232	0.000	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;unclassified;unclassified;unclassified</i>

otu348	10384	307	10812	375	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria ;Sphingobacteriales;Flexibacteraceae;Cytophaga</i>
otu341	11320	418	10886	259	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu436	9919	522	9377	340	0.000	No	<i>Bacteria;Chloroflexi;Anaerolineae;Anaerolineales;Anaerolinaceae;Anaerolinea</i>
otu263	8239	445	8879	597	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu362	11034	214	11335	277	0.000	No	<i>Bacteria;Planctomycetes;Planctomycea;Planctomycetales;Planctomycetaceae;Rhodopirellula</i>
otu420	11923	329	11587	210	0.000	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Streptomycetaceae;Streptomyces</i>
otu025	8946	450	9561	575	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu370	12438	414	12026	248	0.000	No	<i>Bacteria;Verrucomicrobia;Verrucomicrobiae;Verrucomicrobiales;unclassified;unclassified</i>
otu414	10738	297	11125	351	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Methylococcales;Methylococcaceae;unclassified</i>
otu599	9098	539	8535	393	0.000	No	<i>Bacteria;Tenericutes;Mollicutes;Mycoplasmatales;Mycoplasmataceae;Mycoplasma</i>
otu259	9068	552	8488	409	0.000	No	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>
otu588	9500	352	9956	418	0.000	No	<i>Bacteria;Bacteroidetes;Sphingobacteria ;Sphingobacteriales;Saprospiraceae;unclassified</i>
otu567	10637	503	10142	318	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Oceanospirillales;unclassified;unclassified</i>
otu430	10628	664	9944	508	0.000	No	<i>Bacteria;Cyanobacteria;Synechococcophyceae;Pseudanabaenales;Pseudanabaenaceae;unclassified</i>
otu330	11199	366	10853	207	0.000	No	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;unclassified</i>
otu553	10314	312	10660	290	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonad</i>

							<i>aceae;Pseudomonas</i>
otu359	10729	215	10466	246	0.000	No	<i>Bacteria;Planctomycetes;Planctomyce;Planctomycetales;Planctomycetaceae;unclassified</i>
otu385	9317	391	9767	399	0.000	No	<i>Bacteria;Chloroflexi;Anaerolineae;Anaerolineales;Anaerolinaceae;A4b</i>
otu122	10126	336	10561	428	0.000	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu523	10596	509	10033	489	0.000	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu016	7482	973	8886	1504	0.001	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Cellulomonadaceae;Actinotalea</i>
otu089	9806	447	9251	547	0.001	No	<i>Bacteria;Planctomycetes;vadinHA49;unclassified;unclassified;unclassified</i>
otu357	7618	495	8277	678	0.001	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;Oxalobacteraceae;unclassified</i>
otu396	11211	279	10925	238	0.001	No	<i>Bacteria;Firmicutes;Bacilli;Bacillales;Paenibacillaceae;Paenibacillus</i>
otu546	7812	1236	6652	816	0.001	No	<i>Bacteria;Cyanobacteria;Synechococcophyceae;Pseudanabaenales;Pseudanabaenaceae;unclassified</i>
otu232	9526	492	9067	323	0.001	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu514	10185	195	9946	243	0.001	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu581	8763	434	9320	587	0.001	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu126	7078	711	7764	538	0.001	No	<i>Bacteria;Bacteroidetes;Flavobacteria;Flavobacteriales;Flavobacteriaceae;Flavobacterium</i>
otu039	11600	476	11163	314	0.001	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodospirillales;Rhodospirillaceae;unclassified</i>
otu524	9050	640	8485	370	0.001	No	<i>Bacteria;Firmicutes;Bacilli;Bacillales;Bacillaceae;Bacillus</i>
otu418	9699	347	10130	475	0.001	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonad</i>

							<i>aceae;Pseudomonas</i>
otu585	9882	565	9392	340	0.001	No	<i>Bacteria;Bacteroidetes;unclassified;unclassified;unclassified;unclassified</i>
otu065	10786	701	11386	402	0.001	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Shinella</i>
otu011	9303	431	9822	573	0.001	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu548	9135	884	9814	265	0.001	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhizobiales;Rhizobiaceae;Rhizobium</i>
otu405	11857	383	12201	296	0.002	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingomonas</i>
otu387	5725	740	6693	1187	0.002	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Stenotrophomonas</i>
otu242	9936	494	9523	336	0.002	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu207	11461	363	11160	247	0.003	No	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified</i>
otu073	10390	238	10126	313	0.003	No	<i>Bacteria;Acidobacteria;Solibacteres;Solibacterales;Solibacteraceae;Candidatus_Solibacter</i>
otu525	9316	518	8901	338	0.003	No	<i>Bacteria;Firmicutes;unclassified;unclassified;unclassified;unclassified</i>
otu208	9741	417	9394	316	0.004	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;unclassified;unclassified</i>
otu343	9978	555	9529	394	0.004	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Moraxellacea;Acinetobacter</i>
otu369	10143	512	10622	525	0.004	No	<i>Bacteria;Planctomycetes;Phycisphaerae;Phycisphaerales;unclassified;unclassified</i>
otu095	10266	464	10655	377	0.004	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Pseudomonadales;Pseudomonadaceae;Pseudomonas</i>
otu395	11424	217	11154	361	0.004	No	<i>Bacteria;SM2F11;unclassified;unclassified;unclassified;unclassified</i>

otu101	10383	405	10010	414	0.004	No	<i>Bacteria;Thermi;Deinococci;Deinococcales;Deinococcaceae;Deinococcus</i>
otu469	9130	597	8654	434	0.005	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;unclassified;unclassified</i>
otu223	9524	534	9093	416	0.005	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu064	10060	254	9750	427	0.005	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Myxococcales;Polyangiaceae;unclassified</i>
otu367	11493	335	11227	261	0.006	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Chitinophagaceae;unclassified</i>
otu302	9002	510	8483	674	0.006	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu328	11027	480	10655	373	0.007	No	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified</i>
otu564	7969	570	7454	657	0.009	No	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified;unclassified</i>
otu129	9606	861	10240	632	0.009	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Stenotrophomonas</i>
otu092	9541	612	10017	540	0.010	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Legionellales;Legionellaceae;Legionella</i>
otu347	10138	531	10514	360	0.010	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Flexibacteraceae;Cytophaga</i>
otu566	11129	433	10842	243	0.012	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Rhodobacterales;Rhodobacteraceae;unclassified</i>
otu535	10588	433	10287	303	0.013	No	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;unclassified</i>
otu482	9392	403	8837	917	0.014	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Cellulomonadaceae;unclassified</i>
otu040	9657	601	9220	495	0.014	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;unclassified;unclassified;unclassified</i>
otu400	10399	541	10786	434	0.014	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Caulobacterales;Caulobacterace</i>

							<i>ae;Mycoplana</i>
otu305	8822	492	8289	831	0.014	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;unclassified;unclassified</i>
otu340	10715	378	10461	258	0.016	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu517	8640	478	8069	934	0.016	No	<i>Bacteria;Firmicutes;Bacilli;Bacillales;Bacillaceae;Bacillus</i>
otu316	10014	412	9716	362	0.017	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;unclassified;unclassified;unclassified</i>
otu584	9128	655	8695	452	0.017	No	<i>Bacteria;Bacteroidetes;Sphingobacteria;Sphingobacteriales;Flexibacteraceae;unclassified</i>
otu479	8944	573	8553	446	0.018	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu539	10100	661	9670	444	0.018	No	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;unclassified</i>
otu363	9433	261	9199	355	0.019	No	<i>Bacteria;Acidobacteria;Solibacteres;Solibacterales;Solibacteraceae;Candidatus_Solibacter</i>
otu090	8985	489	8599	551	0.021	No	<i>Bacteria;Planctomycetes;vadinHA49;unclassified;unclassified;unclassified</i>
otu300	10903	191	10457	843	0.021	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu134	9562	567	9022	888	0.023	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu461	11062	262	11231	193	0.024	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Nocardioidaceae;Nocardioides</i>
otu173	9615	635	9224	408	0.024	No	<i>Bacteria;Proteobacteria;unclassified;unclassified;unclassified</i>
otu161	9874	604	9492	426	0.024	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu481	11444	333	11234	234	0.024	No	<i>Bacteria;Firmicutes;Bacilli;Bacillales;unclassified;unclassified</i>
otu505	9340	898	9825	260	0.024	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu486	9955	555	9604	397	0.024	No	<i>Bacteria;Proteobacteria;Deltaproteobacteria;Syntrophobacterales;Desulfobacte</i>

							<i>raceae;unclassified</i>
otu094	6958	1063	7905	1550	0.025	No	<i>Bacteria;Proteobacteria;Gammaproteobacteri a;Xanthomonadales;Xanthomonadaceae;Stenotrophomonas</i>
otu344	10740	280	10979	383	0.025	No	<i>Bacteria;Bacteroidetes;Sphingobacteria ;Sphingobacteriales;Flexibacteraceae;unclassified</i>
otu137	9994	415	10345	569	0.027	No	<i>Bacteria;Firmicutes;Clostridia;Clostridi ales;Lachnospiraceae;unclassified</i>
otu176	10506	262	10031	926	0.027	No	<i>Bacteria;Planctomycetes;Planctomycea;unclassified;unclassified;unclassified</i>
otu406	8277	1035	9080	1252	0.029	No	<i>Bacteria;Bacteroidetes;Flavobacteria;Flavobacteriales;Cryomorphaceae;Fluvii cola</i>
otu424	11203	261	10987	355	0.029	No	<i>Bacteria;Bacteroidetes;Flavobacteria;Flavobacteriales;Flavobacteriaceae;Flavobacterium</i>
otu438	10409	543	10083	377	0.031	No	<i>Bacteria;Tenericutes;Erysipelotrichi;Erysipelotrichales;Erysipelotrichaceae;All obaculum</i>
otu317	9287	573	8957	365	0.034	No	<i>Bacteria;Firmicutes;Clostridia;Clostridi ales;Lachnospiraceae;unclassified</i>
otu534	10151	621	9779	462	0.035	No	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;unclassified</i>
otu596	9692	508	9385	391	0.036	No	<i>Bacteria;Verrucomicrobia;Verrucomicrob iae;Verrucomicrobiales;Verrucomicrobriaceae;unclassified</i>
otu031	7031	867	6398	1028	0.038	No	<i>Bacteria;Firmicutes;Clostridia;Clostridi ales;Lachnospiraceae;unclassified</i>
otu148	10933	923	10356	802	0.038	No	<i>Bacteria;Cyanobacteria;Synechococcophycideae;Pseudanabaenales;Pseudanab aenaceae;Leptolyngbya</i>
otu530	8699	392	8226	943	0.038	No	<i>Bacteria;Acidobacteria;Acidobacteria;Acidobacteriales;Acidobacteriaceae;unclassified</i>
otu125	9630	360	9930	540	0.040	No	<i>Bacteria;Bacteroidetes;Flavobacteria;Flavobacteriales;Flavobacteriaceae;Ulvi bacter</i>
otu261	10704	609	10356	429	0.041	No	<i>Bacteria;Bacteroidetes;Bacteroidia;Bacteroidales;RikenellaceaeII;unclassified</i>

otu426	8601	572	8282	374	0.041	No	<i>Bacteria;Proteobacteria;Betaproteobacteria;Burkholderiales;Burkholderiaceae;Cupriavidus</i>
otu140	10708	347	10414	541	0.042	No	<i>Bacteria;Actinobacteria;Actinobacteria;Acidimicrobiales;AKIW874;unclassified</i>
otu117	8713	833	9250	814	0.042	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Stenotrophomonas</i>
otu123	8981	789	9482	747	0.042	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Enterobacteriales;Enterobacteriaceae;Pantoea</i>
otu342	10424	467	10166	304	0.042	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Pseudonocardiaceae;Pseudonocardia</i>
otu407	13006	208	12853	264	0.042	No	<i>Bacteria;Actinobacteria;Actinobacteria;Actinomycetales;Streptosporangiaceae;Acrocarpospora</i>
otu476	13101	300	13305	329	0.043	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;unclassified;unclassified</i>
otu115	9774	762	10275	790	0.043	No	<i>Bacteria;Proteobacteria;Gammaproteobacteria;Xanthomonadales;Xanthomonadaceae;Xanthomonas</i>
otu457	10660	532	10371	337	0.044	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>
otu015	9818	758	9239	1054	0.048	No	<i>Bacteria;Proteobacteria;Alphaproteobacteria;Sphingomonadales;Sphingomonadaceae;Sphingomonas</i>
otu279	6978	771	6385	1086	0.048	No	<i>Bacteria;Firmicutes;Clostridia;Clostridiales;Lachnospiraceae;unclassified</i>

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