Electronic Supplementary Material (ESI) for RSC Advances.

Table S1 Experimental condition designed by BBD and the values of two responses for the study

Run no.	Temperature (℃)	C/N	pH	Final NO_3^--N concentration (mg L^{-1})	Fe (II) oxidizing rate (mg Fe^{2+} L^{-1})
Run 1	25	1	12	46.0	0.9
Run 2	25	1.75	8	0	5.2
Run 3	25	1.75	8	0	5.0
Run 4	25	2.50	12	45.7	1.1
Run 5	35	1.75	4	0	5.0
Run 6	15	2.50	8	0.084	4.4
Run 7	35	1	8	0	3.8
Run 8	25	2.50	4	35.0	4.2
Run 9	15	1.75	4	38.9	3.7
Run 10	25	1	4	43.0	3.0
Run 11	15	1.75	12	43.0	1.2
Run 12	35	1.75	12	42.4	1.1
Run 13	35	2.50	8	0	5.7
Run 14	15	1	8	23.9	3.5

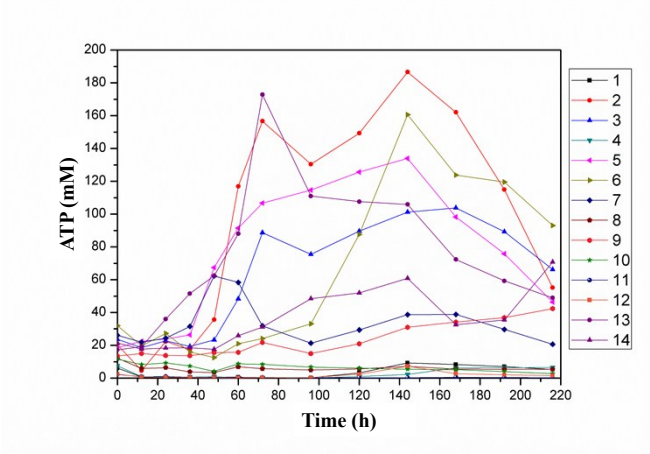

Figure S1 ATP concentration during the experiment for all Runs. ATP represent the activity and abundance of microbes.

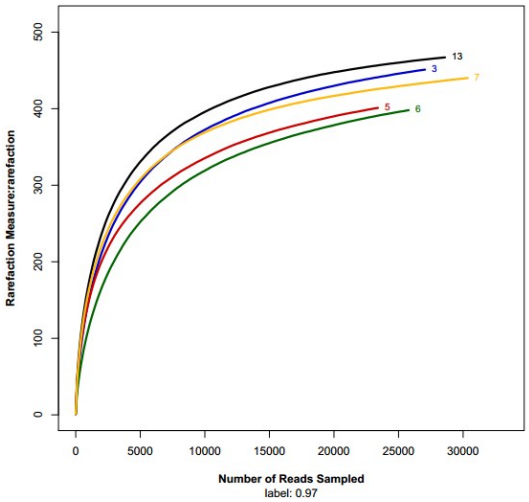

Figure S2 Rarefaction curves for five samples with low final NO_3^--N concentration and high Fe(Ⅱ) oxidizing rate.

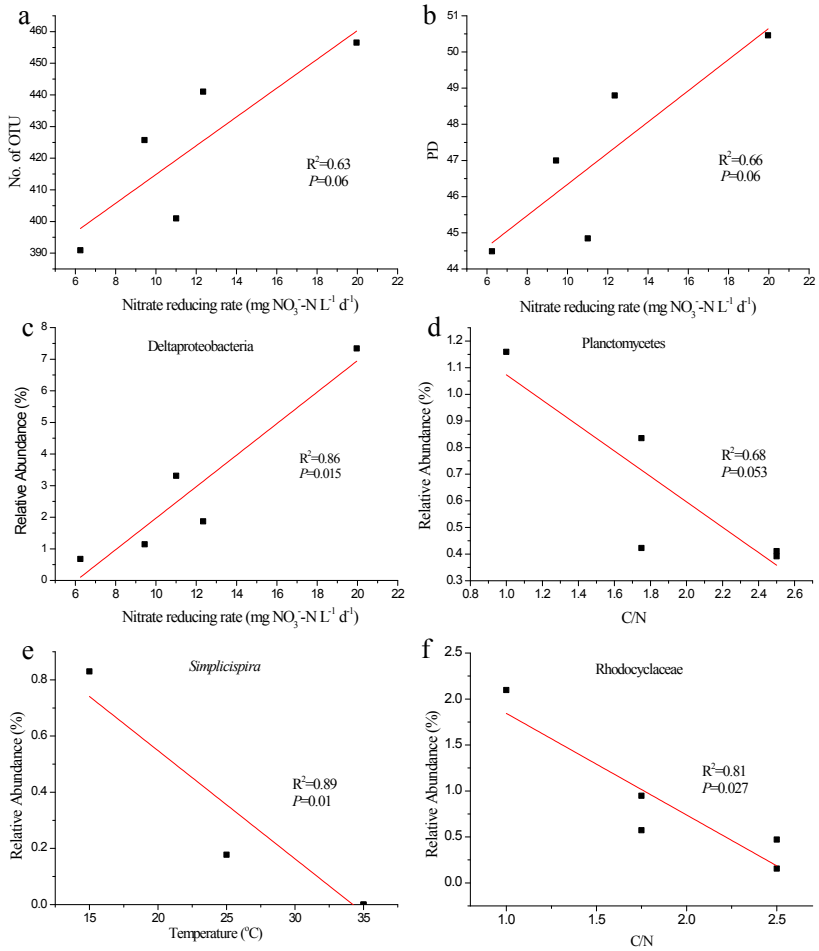

Figure S3 Linear correlations between (a) PD and nitrate-N reducing rate; (b) no. of OTU and nitrate-N reducing rate; (c) relative abundance of Deltaproteobacteria and nitrate-N reducing rate; (d) relative abundance of Planctomycetes and C/N ratio; (e) relative abundance of *Simlicispira* and temperature; (f) relative abundance of Rhodocyclaceae and C/N ratio.

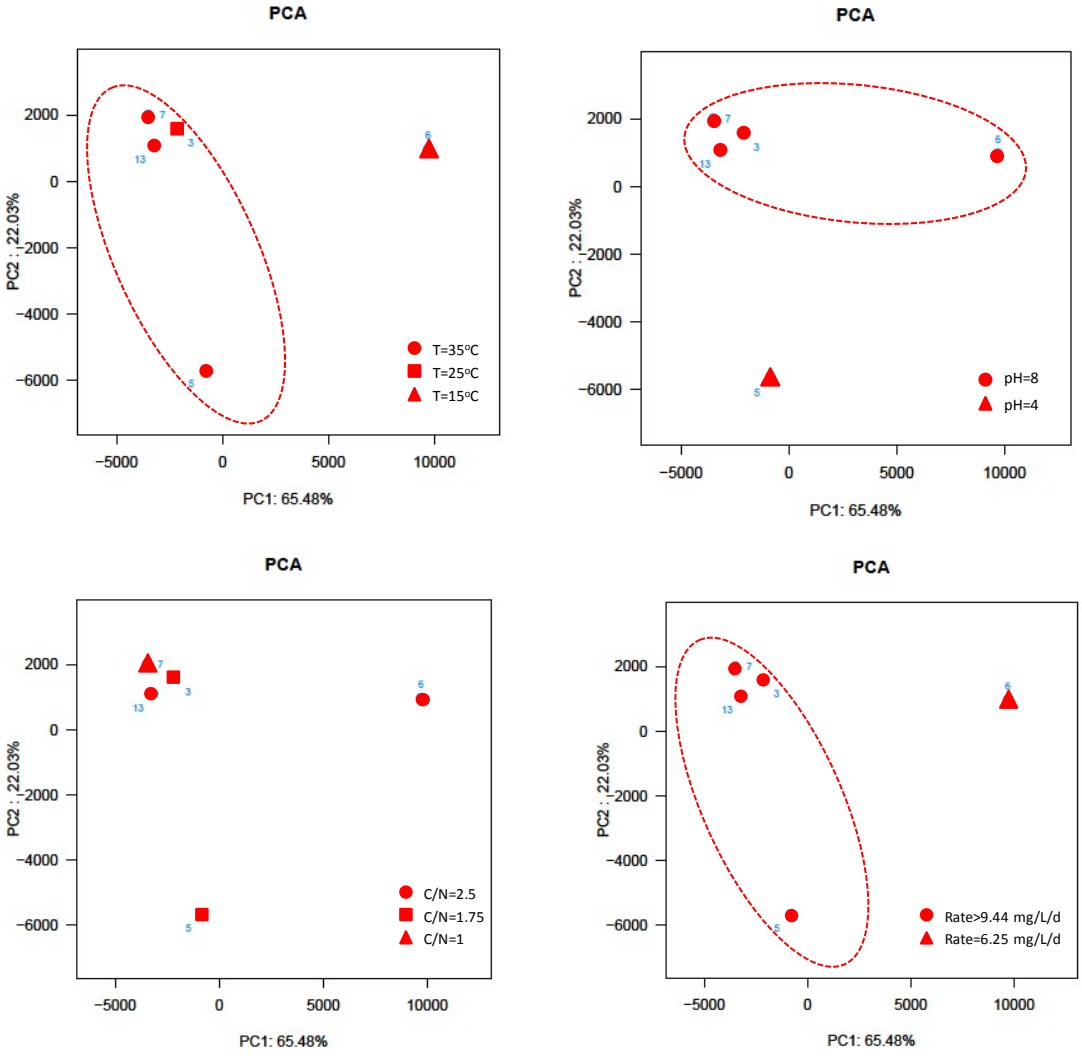

Figure S4 PCA analysis of microbial communities of five runs in BBD experiment. Samples that cluster close together share a greater similarity in composition.