

## Supplementary Methods

### 1. Seed germination assay for safety validation of strain L11

The strain L11 was cultured in LB broth at 28 °C with shaking until the optical density at 600 nm (OD<sub>600</sub>) reached 1.0. And then Chinese cabbage (*Brassica rapa* subsp. *chinensis*) seeds were surface-sterilized with 75% ethanol for 30 s, followed by 0.5% sodium hypochlorite (NaClO) for 5 min, and then rinsed thoroughly with sterile distilled water. The sterilized seeds were soaked in the L11 suspension (experimental group) or sterile distilled water (control group) for 1 h at room temperature. After soaking, the seeds were placed on sterile filter paper moistened with sterile distilled water in sterile Petri dishes. Each treatment contained 20 seeds per dish. The dishes were incubated at 28 °C in darkness. Seed germination (radicle emergence) was recorded daily for 3 days, and the germination phenotypes were compared between the L11 treatment and the control.

### Supplementary Figures and Tables

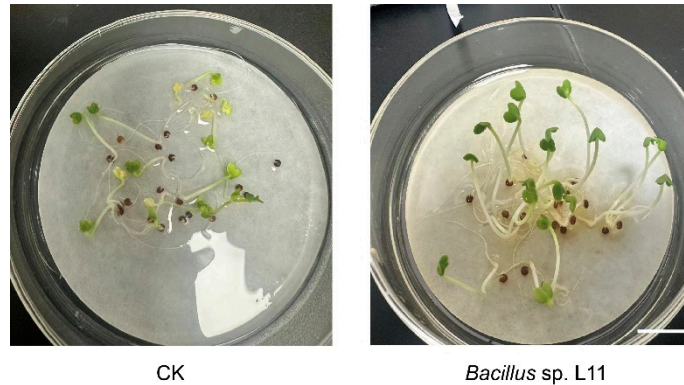
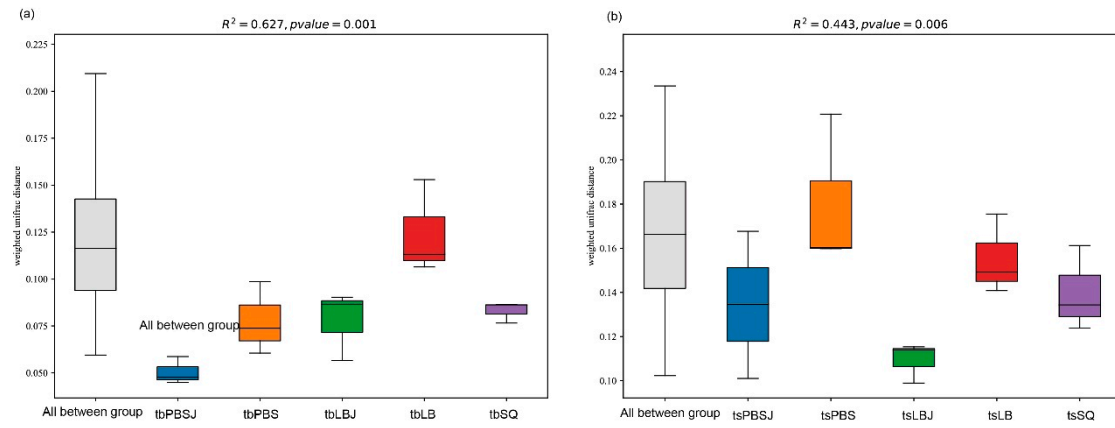
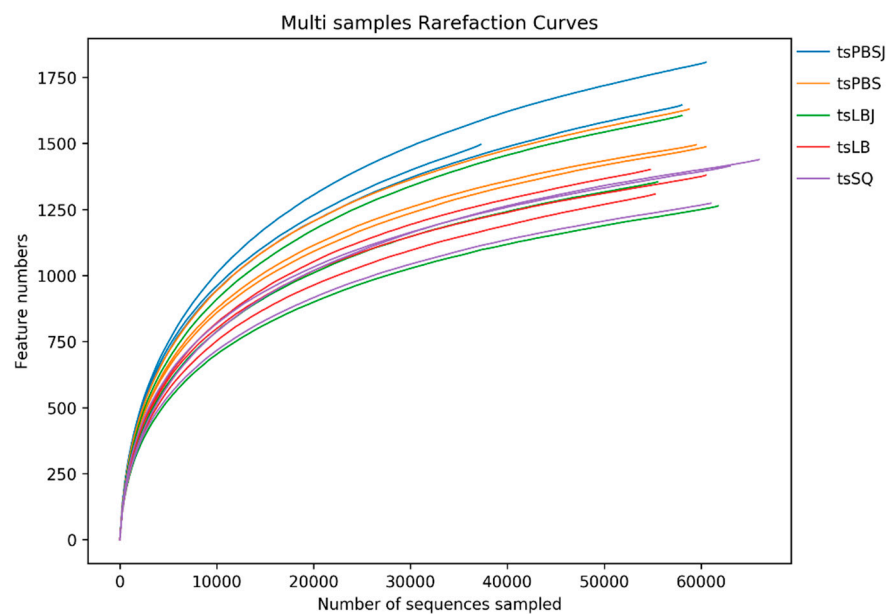


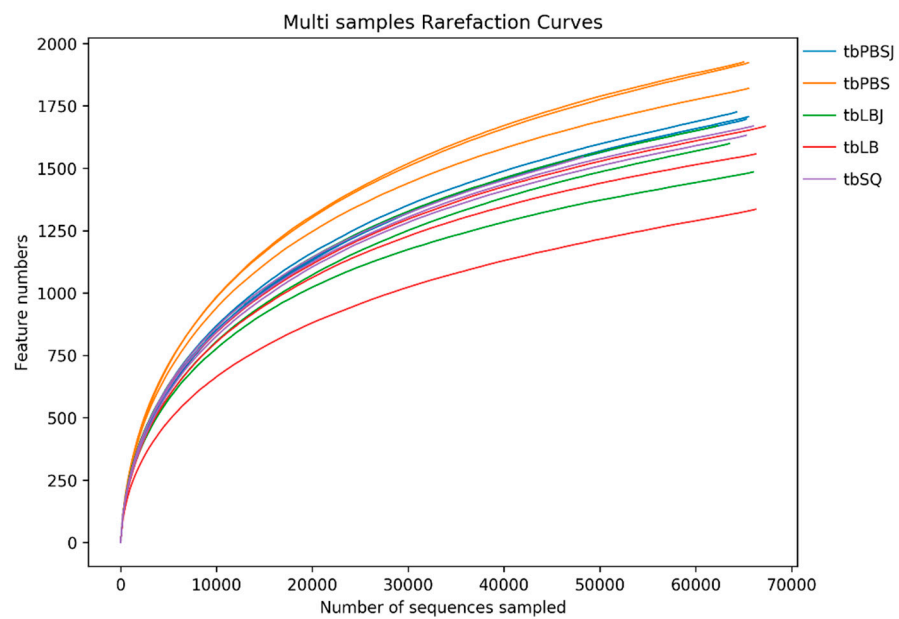
Figure S1. Seed germination phenotypes of the L11 treatment and control groups.



**Figure S2. Permutational multivariate analysis of variance (PERMANOVA) based on weighted unifrac distance.** (a) *S. lycopersicum* seedlings cultivated in peat-based artificial substrate. (b) *S. lycopersicum* seedlings cultivated in soil. tb: peat-based artificial substrate cultivation; ts: soil cultivation.



**Figure S3. Rarefaction Curves of bacterial community in soil cultivation system.**



**Figure S4. Rarefaction Curves of bacterial community in artificial peat-based substrates.**

Table S1 Sample Sequencing Data

Sample ID	Raw Reads	Clean Reads	Effective Reads	AvgLen (bp)	GC (%)	Q20 (%)	Q30 (%)	Effective (%)
tbLB1	80083	75494	70890	417	55.01	99.34	96.84	88.52
tbLB2	78889	74119	69073	419	54.17	99.33	96.79	87.56
tbLB3	80072	75017	70214	417	54.84	99.28	96.61	87.69
tbLBJ1	78934	73175	69078	416	54.33	99.29	96.65	87.51
tbLBJ2	80191	75544	67807	416	54.69	99.3	96.67	84.56
tbLBJ3	80299	74352	67946	417	54.22	99.31	96.78	84.62
tbPBS1	79971	74273	69677	416	54.85	99.29	96.67	87.13
tbPBS2	79957	74863	69721	416	54.92	99.31	96.73	87.2
tbPBS3	79998	74488	69837	417	55.12	99.33	96.8	87.3
tbPBSJ1	79896	75472	69829	417	54.9	99.29	96.68	87.4
tbPBSJ2	76619	71822	67916	416	54.84	99.35	96.92	88.64
tbPBSJ3	80012	74192	69571	416	54.66	99.28	96.63	86.95
tbSQ1	79998	74704	69885	416	54.64	99.32	96.79	87.36
tbSQ2	57151	52977	50446	416	54.7	99.36	96.94	88.27
tbSQ3	80056	75197	69590	416	54.51	99.33	96.8	86.93
tsLB1	66927	60198	57296	422	53.14	99.09	96.05	85.61
tsLB2	76970	68211	63296	420	53.48	99.07	96.03	82.23
tsLB3	68368	62270	57603	419	53.25	99.12	96.2	84.25
tsLBJ1	80032	71605	62756	419	53.7	99.09	96.09	78.41
tsLBJ2	79901	72803	65277	420	53.44	99.11	96.16	81.7
tsLBJ3	70506	62599	58216	420	53.39	99.08	96.01	82.57
tsPBS1	79996	71779	64511	419	54.43	99.23	96.55	80.64
tsPBS2	79981	74454	64892	419	53.84	99.28	96.66	81.13
tsPBS3	79972	73770	64971	421	53.19	99.24	96.48	81.24
tsPBSJ1	80219	74305	65451	419	53.82	99.21	96.42	81.59
tsPBSJ2	79900	72918	63369	419	53.78	99.22	96.44	79.31
tsPBSJ3	47336	43729	39839	419	53.1	99.18	96.29	84.16
tsSQ1	80050	72355	66255	419	53.3	99.1	96.13	82.77
tsSQ2	75392	68627	63639	420	53.76	99.15	96.23	84.41
tsSQ3	79961	73233	68718	421	53.61	99.1	96.12	85.94