**Supplementary Fig. S1.** Histograms illustrate the raw sequences (in blue) and effective sequences (in dark red) obtained through sequencing. This analysis was conducted on soil samples collected over four years: 2019 (A), 2020 (B), 2021 (C), and 2022 (D). The sequence data from three replications for each treatment, spanning from 2019 to 2022, were used for bacterial community analysis in the soil. The Operational Taxonomic Units (OTUs) are plotted on the Y-axis, based on effective sequences, to evaluate the impact of three organic amendments: dried molasses (MS), mustard meal (MM), a combined half-rate of both (½ MS + ½ MM), a non-amended control (NTC), and chemical soil fumigation (Pic-Clor 60, PC) on the X-axis.
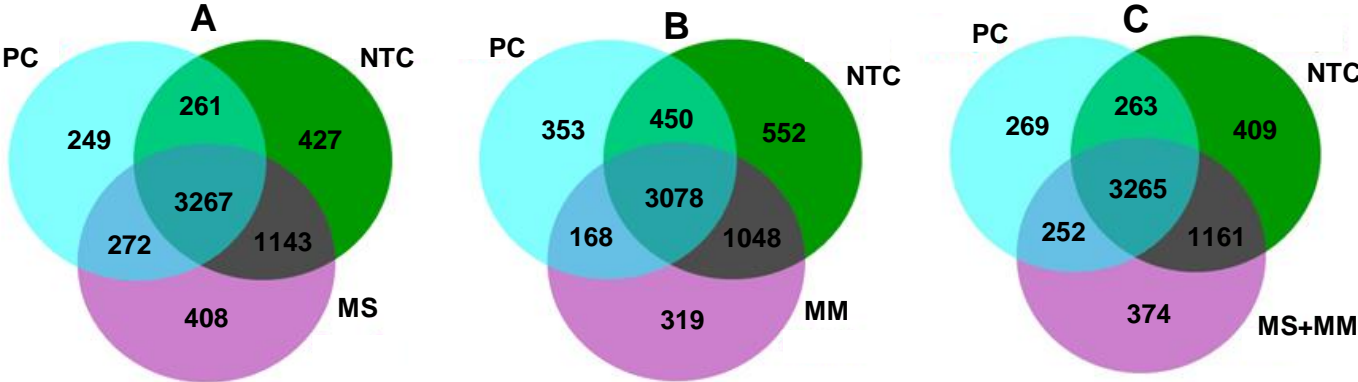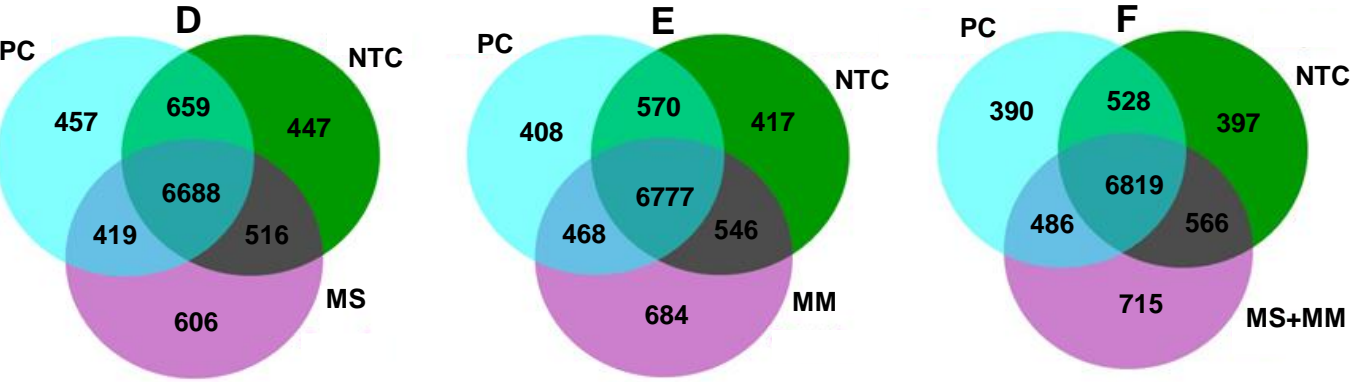
Supplementary Fig. S1
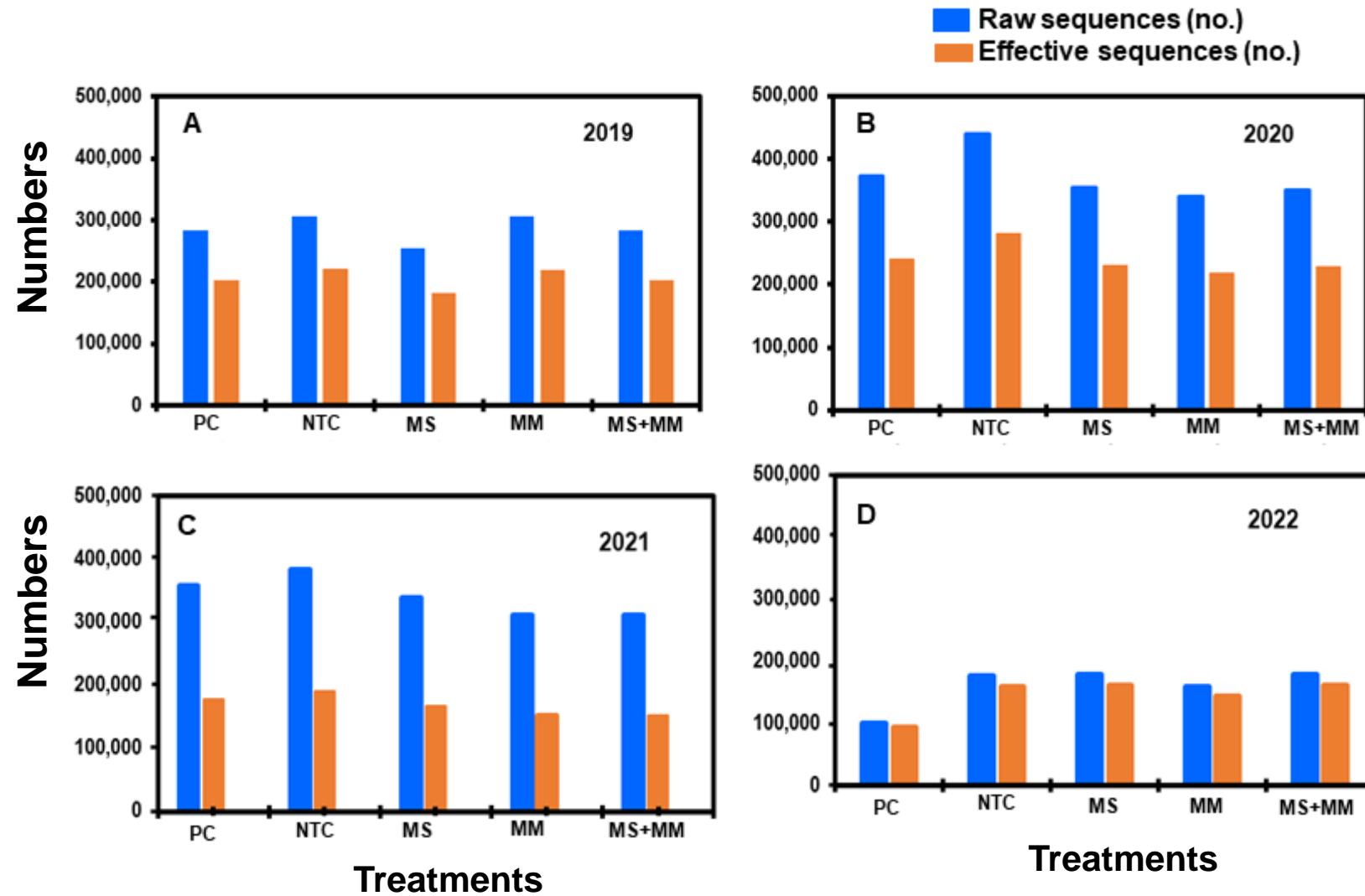
Supplementary Fig. S2. Venn diagrams showed the number of operational taxonomic units (OTUs) in response to three organic amendments: dried molasses (MS), mustard meal (MM), and a combination half-rate of both (½MS + ½MM). The controls included non-amended control (NTC) and chemical soil fumigation with Pic-Clor 60 (PC). Each circle in the diagram represents one treatment, and the overlapping values indicate common or shared OTU counts at 97% identity on effective sequences. The sequence data from three replications in each treatment from 2019 to 2022 were used for bacterial community analysis in the soil.

2019

A
PC
NTC
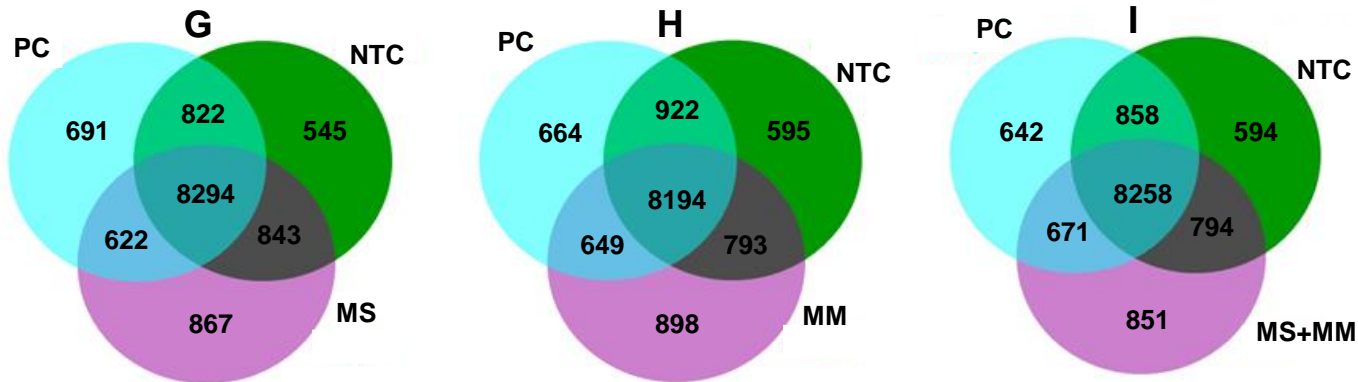249
261
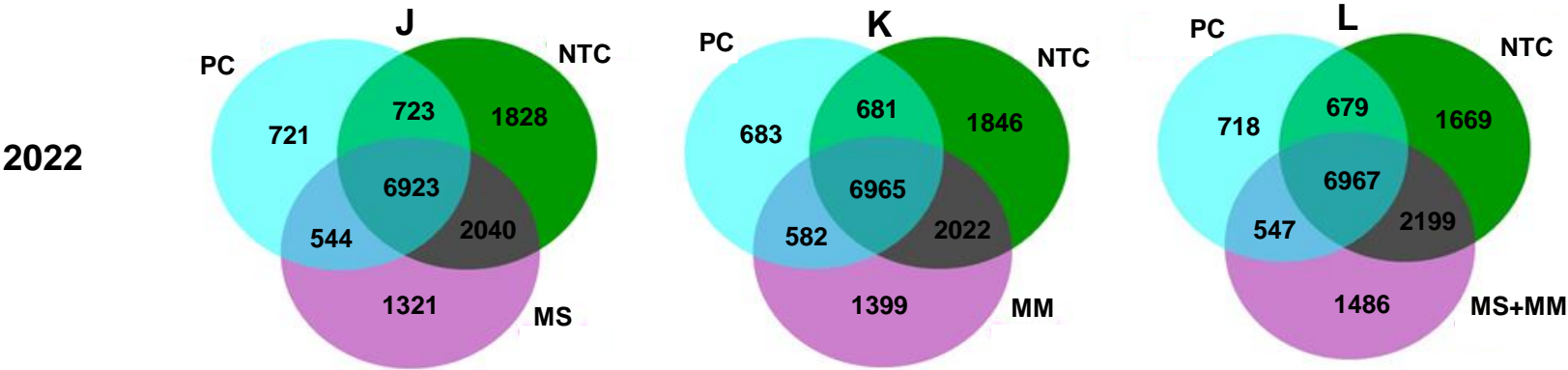427
3267
272
1143
408
MS

B
PC
NTC
353
450
552
3078
168
1048
319
MM

C
PC
NTC
269
263
409
3265
252
1161
374
MS+MM

2020

D
PC
NTC
457
659
447
6688
419
516
606
MS

E
PC
NTC
408
570
417
6777
468
546
684
MM

F
PC
NTC
390
528
397
6819
486
566
715
MS+MM

2021

G
PC
NTC
691
822
545
8294
622
843
867
MS

H
PC
NTC
664
922
595
8194
649
793
898
MM

I
PC
NTC
642
858
594
8258
671
794
851
MS+MM

2022

Supplementary Fig. S3. Correlation analysis was conducted to compare the total marketable yield in 2020 and 2021. The Spearman's correlation coefficient was 0.98 ($P \geq 0.0001$) for 10 treatments in 2020 and 2021.