Article

Repeated Application of Rice Straw Stabilizes Soil Bacterial Community Composition and Inhibits Clubroot Disease

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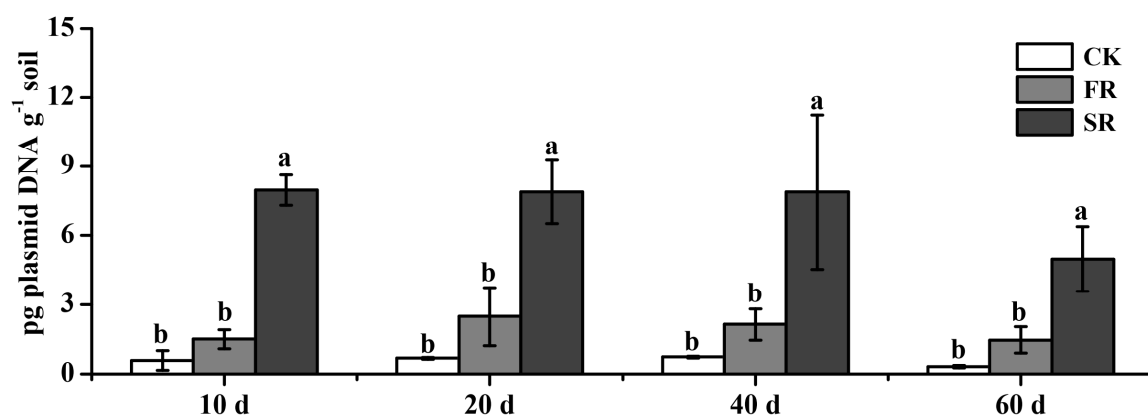* Correspondence: mugonglin@aliyun.com; Tel.: +86-451-55190563

Figure S1. Abundance of *Plasmodiophora brassicae* in response to straw application. CK, no straw application; FR, one-year straw application; SR, two-year straw application. Labels of the abscissa axis indicate the survey time (day after sowing). Error bars indicate the standard error, and different letters indicate significant differences at the 0.05 level (Tukey's HSD test).
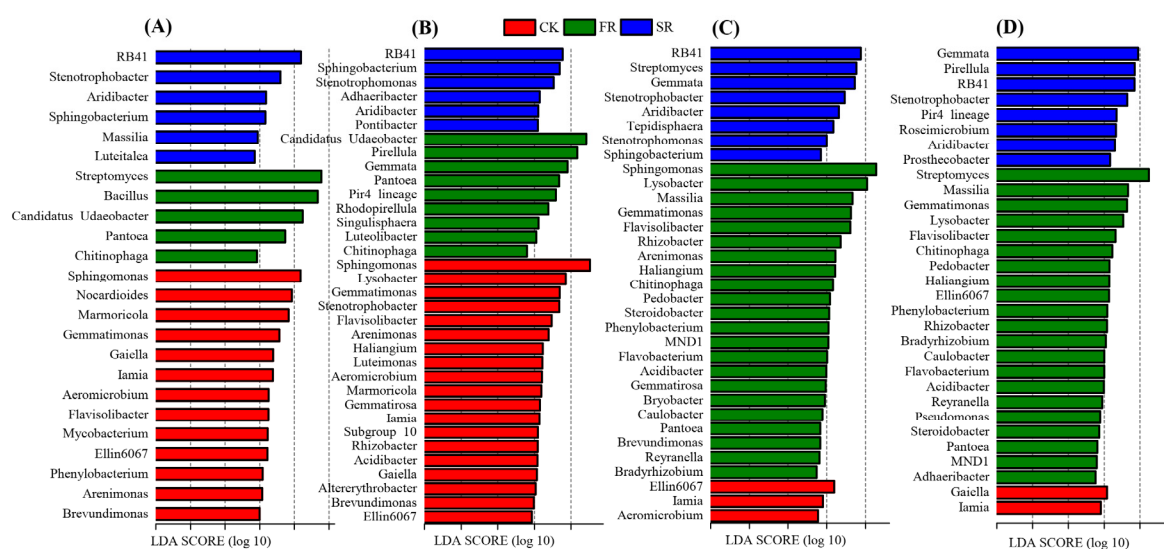
Figure S2. Linear discriminant analysis (LDA) histogram scores computed for the bacterial genera response to straw application: (**A**) 10 days after sowing, (**B**) 20 days after sowing, (**C**) 40 days after sowing and (**D**) 60 days after sowing. CK, no straw application; FR, one-year straw application; SR, two-year straw application. The threshold employed for the logarithmic LDA score for discriminative features was 2.0.
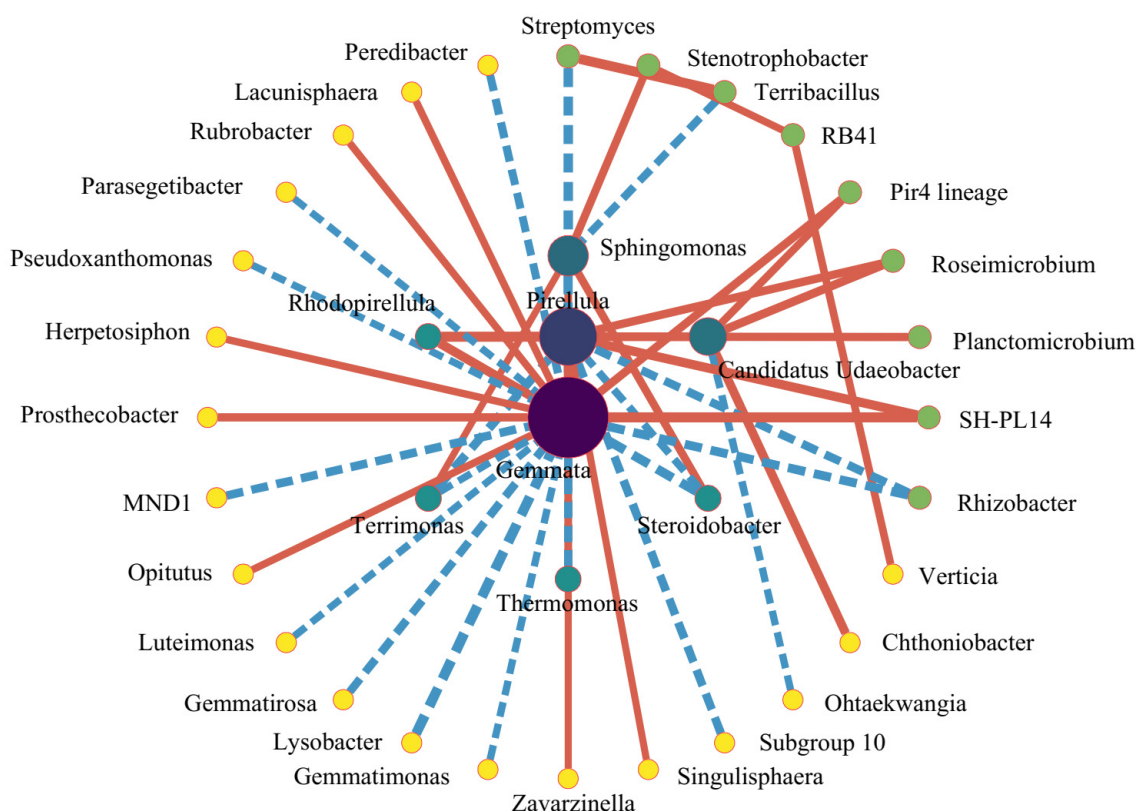

Figure S2. Network plots of the bacterial community at the genus level. The size of the node corresponds to the relative abundance of genus. The node colors show various phylogenetic associations. Node (edge) connection lines represent co-occurrence with positive (blue) and negative (red) correlations.
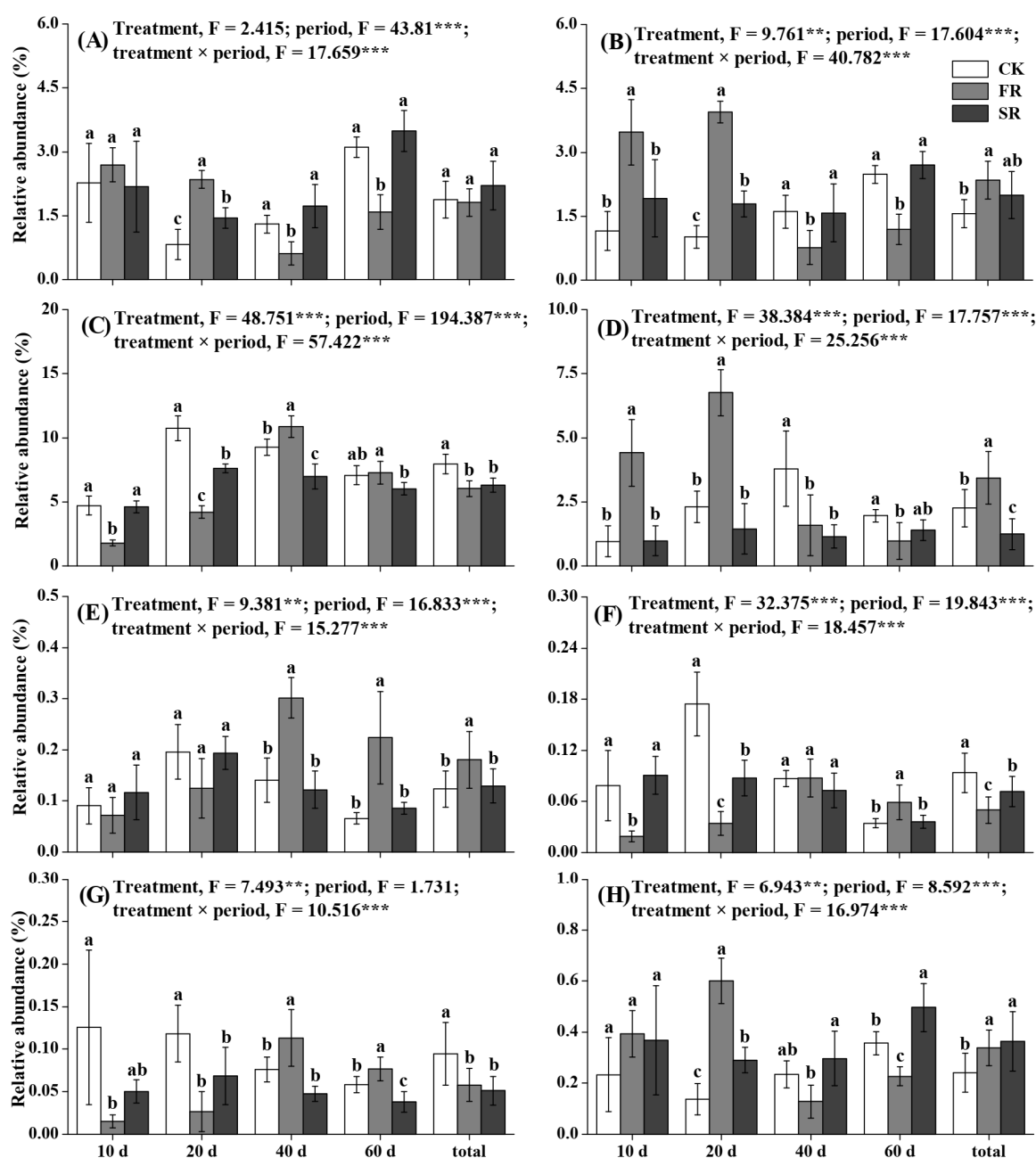
Figure S3. Relative abundance of the selected bacterial genera response to straw application. (**A**) *Gemmata*, (**B**) *Pirellula*, (**C**) *Sphingomonas*, (**D**) *Candidatus Udaeobacter*, (**E**) *Steroidobacter*, (**F**) *Thermomonas*, (**G**) *Terrimonas* and (**H**) *Rhodopirellula*. CK, no straw application; FR, one-year straw application; SR, two-year straw application. Labels of the abscissa axis indicate the indicator survey time (day after sowing), and total indicates the mean value for each period. Error bars indicate the standard error, and different letters indicate significant differences at the 0.05 level (Tukey's HSD test). The text in the figure represents the effects of the treatment and period based on the repeated-measures ANOVA. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table S1. Basic soil chemical properties of the cultivated soil in the second year.

Soil chemical properties	CK–FR	SR
SOM (%)	2.99 ± 0.75a	3.21 ± 0.61a
AN (mg kg^{-1})	173.70 ± 23.79a	148.34 ± 2.15a
AP (mg kg^{-1})	764.09 ± 184.34a	910.36 ± 23.51a
AK (mg kg^{-1})	516.00 ± 6.93b	732.00 ± 13.86a
pH	6.97 ± 0.05b	7.15 ± 0.06a
EC (mS cm^{-1})	1.43 ± 0.02a	1.63 ± 0.13a

CK–FR, no treatment in the first year; SR, treated with rice straw in the year before. SOM, soil organic matter; AN, available nitrogen; AP, available phosphorus; AK, available potassium; EC, electrical conductivity. Values (mean ± SD) with different letters indicate significant differences at the 0.05 level (Tukey's HSD test).

Table S2. Pearson's correlation coefficients between the bacterial phyla and chemical properties in the soils.

Bacterial phylum	SOM	AN	AP	AK	pH	EC
Proteobacteria	**−0.547****	0.143	0.142	**−0.363****	0.01	**−0.368****
Acidobacteria	−0.031	−0.159	0.121	**0.341****	**0.471****	0.213
Chloroflexi	**0.571****	−0.165	0.062	**0.507****	**0.235***	**0.530****
Gemmatimonadetes	**−0.658****	0.071	0.109	**−0.482****	−0.196	**−0.550****
Bacteroidetes	**−0.302****	−0.041	0.087	−0.121	−0.039	−0.095

Significant effects (*p < 0.05; **p < 0.01) are highlighted in bold. SOM, soil organic matter; AN, available nitrogen; AP, available phosphorus; AK, available potassium; EC, electrical conductivity.

Table S3. Pearson's correlation coefficients between the bacterial genera and chemical properties in the soils.

Bacterial genus	SOM	AN	AP	AK	pH	EC
Gemmata	**0.321****	0.067	0.167	0.137	−0.193	**0.276***
Pirellula	**0.408****	0.158	−0.092	**0.232***	0.166	**0.308****
Sphingomonas	**−0.629****	0.183	0.142	**-0.385****	0.012	**−0.378****
Candidatus Udaeobacter	0.106	0.173	**−0.409****	−0.106	0.117	−0.049
Steroidobacter	**−0.249***	0.094	0.067	−0.133	0.203	−0.138
Thermomonas	**−0.331****	−0.225	−0.187	**−0.236***	−0.083	−0.093
Terrimonas	**−0.380****	−0.143	−0.167	**−0.367****	**−0.328****	**−0.246***
Rhodopirellula	**0.382****	0.116	0.008	0.205	0.084	**0.360****

Significant effects (*p < 0.05; **p < 0.01) are highlighted in bold. SOM, soil organic matter; AN, available nitrogen; AP, available phosphorus; AK, available potassium; EC, electrical conductivity.

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