

# Effects of different previous crops on the occurrence of clubroot disease and rhizosphere microbial community structure



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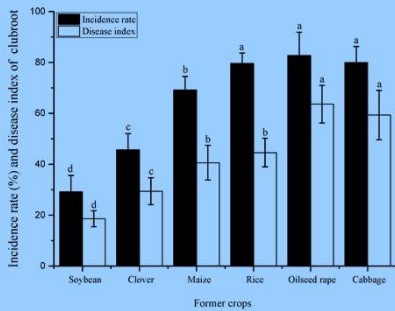
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## 1 Introduction

Previously, we found the incidence (severity) of clubroot in oilseed rape was significantly reduced when oilseed rape was planted after leguminous plants, compared to that with cruciferous crops continuous cropping. To elucidate the microbiological mechanism between former crop and the incidence of clubroot disease, the high-throughput sequencing was used to analyze the rhizosphere microbial community structure of leguminous plants (soybean, clover), gramineae crops (rice, maize) and cruciferous crops (oilseed rape, Chinese cabbage) in this study, and the effects of different previous crops on the occurrence of clubroot in oilseed rape were investigated. The results of this study will help to choose reasonable rotation pattern to reduce the damage of clubroot disease.

## 2 Results

### 1. Effects of different former crops on clubroot in oilseed rape



The leguminous crops could significantly reduce the occurrence and damage of clubroot in oilseed rape

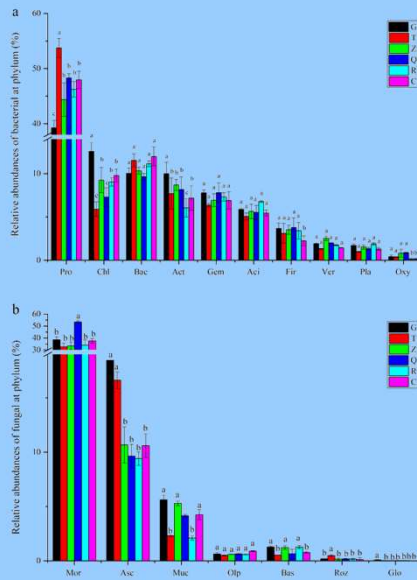
### 2. Abundance and diversity of bacteria and fungi in rhizosphere soil of different crops

Item	Sample ID	Number of OTU	ACE index	Chao1 index	Shannon index	Coverage (%)
Bacteria	G	3666.67±33.98*	3961.16±36.78*	3936.34±31.00*	9.98±0.02*	99.20
	T	3224.00±71.75*	3556.54±75.21*	3528.92±80.61*	9.39±0.07*	99.20
	Z	3561.00±61.38*	3847.17±54.04*	3817.84±60.59*	9.86±0.14*	99.23
	Q	3524.33±125.46*	3870.37±134.18*	3837.49±138.97*	9.71±0.14*	99.13
	R	3572.33±87.20*	3914.42±85.84*	3898.53±71.49*	9.81±0.09*	99.17
	C	3325.00±123.85*	3665.29±162.65 <sup>ab</sup>	3638.34±145.35 <sup>ab</sup>	9.58±0.11*	99.17
Fungi	G	723.67±23.30*	797.70±17.42*	792.43±21.18*	6.11±0.35*	99.80
	T	690.67±121.13*	759.40±119.74*	748.19±121.23*	6.21±0.58*	99.80
	Q	694.33±82.00*	759.25±71.27*	747.81±72.24*	6.14±0.29*	99.80
	Z	771.67±56.57*	842.25±56.47*	834.82±49.29*	6.53±0.31*	99.80
	R	704.00±20.02*	780.99±5.00*	770.76±9.94*	6.22±0.32*	99.80
	C	748.33±35.87*	874.68±113.41*	955.52±231.77*	6.77±0.11*	99.73

The diversity of fungi community was less affected by different previous crops, but the abundance and diversity of bacteria in rhizosphere soil were decreased by planting clover.

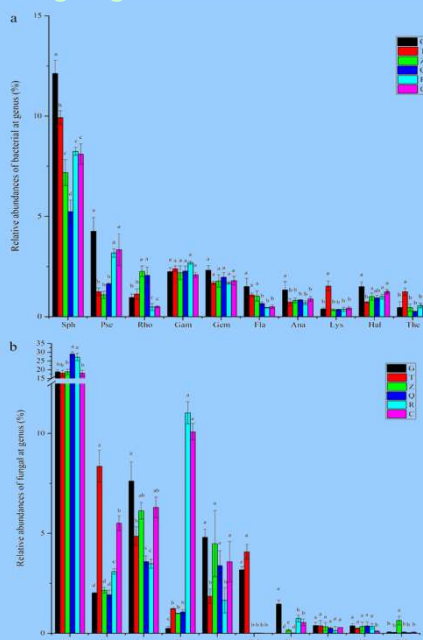
G (Soybean rhizosphere soil), T (Clover rhizosphere soil), Q (Rice rhizosphere soil), Z (Maize rhizosphere soil), R (Oilseed rape rhizosphere soil) and C (Chinese cabbage rhizosphere soil).

### 3. Relative abundances of bacteria and fungi at phylum



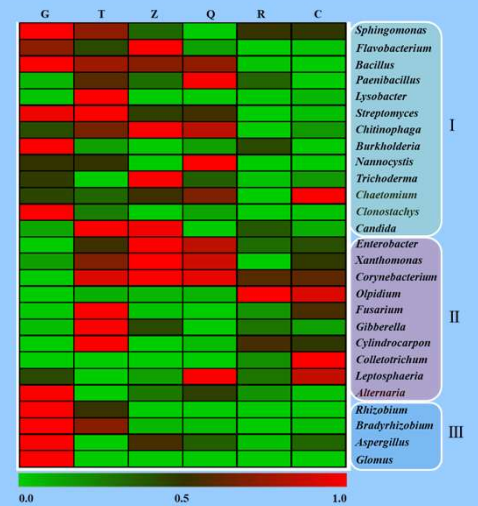
(a) Relative abundances of bacteria at phylum. Pro (Proteobacteria), Chl (Chloroflexi), Bac (Bacteroidetes), Act (Actinobacteria), Gem (Gemmatimonadetes), Aci (Acidobacteria), Fir (Firmicutes), Ver (Verrucomicrobia), Pla (Planctomycetes), Oxy (Oxyphotobacteria). (b) Relative abundances of fungi at phylum. Mor (Mortierellomycota), Asc (Ascomycota), Muc (Mucoromycota), Olp (Olpidiomycota), Bas (Basidiomycota), Roz (Rozellomycota), Glo (Glomeromycota).

### 3. Relative abundances of bacteria and fungi at genus



(a) Relative abundances of bacteria at genus. Sph (*Sphingomonas*), Pse (*Pseudomonas*), Rho (*Rhodanobacter*), Gam (unidentified Gammaproteobacteria), Gem (*Gemmatimonas*), Fla (*Flavobacterium*), Ana (unidentified Anaerolineae), Lys (*Lysoacter*), Hal (*Haliangium*), The (*Thermomonas*). (b) Relative abundances of fungi at genus. Mor (*Mortierella*), Fus (*Fusarium*), Xer (*Xeromyces*), Olp (*Olpidium*), Act (*Actinomorcar*), Pol (*Polythrincium*), Tra (*Trapelia*), Mor (unidentified\_Mortierellomycota), Plu (*Pluteus*), Tal (*Talaromyces*).

### 5. Bacteria and fungi classification statistics based on its function



The contents of bacteria and fungi with biocontrol and biopromotion functions were the lowest, and the abundance of microorganism with were the highest in the rhizosphere soil of cruciferous crops. (I: biological control or plant growth promotion, II: disease inducing, III: others)

## 3 Conclusion

- Different crop rotation patterns had different effects on the incidence of clubroot in oilseed rape.
- Soybean as the former crop could significantly promote the population density of microbial communities which could inhibit the infection of *P. brassicae*.
- Cruciferous crops continuous cropping could significantly accumulate the content of plant pathogens.
- Results reveal the possible microbiological mechanism of the effects of different previous crops on the occurrence of clubroot. Moreover, it is helpful to choose reasonable rotation pattern to reduce the damage of clubroot.

## 4 Acknowledgments

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