EFFECTS OF MAIZE STRAW IN BIOLOGICAL SOIL DISINFESTATION ON SUPPRESSING *ARTEMISIA SELENGENSIS* ROOT ROT PATHOGENS

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Introduction

- Biological soil disinfestation (BSD) is an effective non-chemical method to control soil-borne disease by incorporating organic amendments into flooding soil.
- Crop residues, such as maize straw, are more easily accessible and economical than other organic materials using in BSD. Using crop residues in BSD might provide a new environment-friendly crop residues disposal strategy.
- *Artemisia selengensis* Turcz, called "Li Hao" in Chinese, is a widely favored herbaceous edible weed due to high nutrition and medicine values. Its production is greatly hampered by *Artemisia selengensis* root rot caused by *Fusarium oxysporum* f. sp. *cubense* (FOC), *Phytophthora* spp. and *Pythium* spp..

Aims

The aim of this study was to determine the usefulness of maize straw as organic amendments for BSD in suppressing *Artemisia selengensis* root rot caused by FOC, *Phytophthora* spp. and *Pythium* spp. Different maize straw addition rates (0.2%, 0.5%, 2% (w/w)) and soil irrigation states (soil flooding and soil saturating to reach its 100% water holding capacity) were evaluated to test its efficiency and provide practical guidelines for BSD field promotion. Furthermore, the mechanism of pathogens suppression was also examined by investigating bacterial community structure changes and toxic organic acids productions.

Results

Results showed that all three maize straw adding rates effectively reduced more than 75% pathogens, and the largest maize straw addition led to significantly higher pathogens inactivation (about 90%). When amended with same rates of maize straw, no obvious difference was observed between

flooded and saturated soil conditions. Saturating soil might be a good alternative to soil flooding. Clear bacterial community structure shift and biodiversity enhancement was appeared in both flooding alone and BSD treatments. Two toxic acids producers, *Clostridium* and *Bacillus* spp., were found as predominant populations. Rather high concentrations of acetic acid were detected in all BSD treatments, together with lower amounts of butyric, propionic acid and isoveleric acids, while none of them was detected in CK and flooding alone treatments. The higher rates of maize straw were added in soil, the more amounts of organic acids were produced. Besides, increasing soil pH and organic matter with decreasing nitrate were concomitantly occurred in BSD treated soils.

The major issues to be addressed are:

(1) To determine whether other microbiological communities could greatly affect the survival of pathogens. Obvious increasing of biodiversity in BSD soils indicates there are many other bacterial species proliferated in BSD soils as well.

(2) To determine whether other toxic compounds are involved in the suppression of soil-borne pathogens. Strong reductive and anaerobic soil environment induces complicated changes in soil biogeochemical processes. Organic acids are probably merely one of the factors in the processes.

(3) To elucidate the interactions between crops, microbiota and soil properties and how they work together to reduce soil-borne disease. Soil provides a habitat for plants and microbiota. BSD improves soil physicochemical properties, which might stimulate the growth of plant and increase soil microbiological biodiversity. Healthy plants might further influence soil microbiota and then impact pathogens survival.

Key words: Biological soil disinfestation (BSD); *Artemisia selengensis* root rot; maize straw, bacterial community shift, organic acids