The presence of soybean, but not soybean cropping frequency has influence on SOM priming in crop rotation systems

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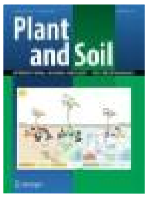

Plant and Soil

Aims and scope

Submit manuscript

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Abstract

Purpose

Legume crops are advocated for integration into crop rotation systems, and cereal-based rotations with the presence of legumes have a substantial effect on improving soil fertility and health. It is not yet clear whether the frequency of legume inclusion in crop rotation systems influences soil biochemical properties and soil organic matter (SOM) mineralization.

Methods

An incubation experiment was conducted with ^{13}C-glucose addition to evaluate the influences of soybean (*Glycine max* L.) cropping frequency on SOM mineralization under long-term wheat (*Triticum aestivum* L.)- and maize (*Zea mays* L.)-based rotation systems. Phospholipid fatty acids (PLFAs) and ^{13}C-PLFAs were measured to explore microbial biomass, community structure and microbial utilization of glucose in wheat and maize systems.

Results

Glucose addition increased native SOM mineralization, i.e. positive priming effect. Compared with less soybean cropping frequency under long-term wheat- and maize-based rotation systems, wheat-soybean-soybean-soybean rotation and maize-soybean-soybean rotation increased the total biomass (PLFAs), fungal biomass and decreased the ratio of bacteria to fungi. Furthermore, the ratio of bacteria to fungi was negatively correlated with PE intensity, indicating that greater fungal biomass played a key role in stimulating SOM priming. That the proportion of ^{13}C-glucose in G- and fungi had a positive relationship with PE intensity also supported this conclusion. The presence of soybean in wheat- and maize-based rotations increased SOM priming, while the soybean cropping frequency had no significant influence on SOM priming. However, in contrast to a maize-based rotation system, the same frequency of soybean in a wheat-based rotation system had lower soil C/N ratio and higher B/F ratio, and resulted in lower PE intensity.

Conclusions

Our findings indicated that the presence of soybean in wheat- and maize-based rotation systems increased PE intensity because of higher soil C/N ratio and lower B/F ratio, while the soybean cropping frequency had no significant influence on SOM priming. Furthermore, the presence of soybean in maize system induced more SOM priming than that in wheat system with glucose addition.

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Supplementary Information

Below is the link to the electronic supplementary material.

Supplementary file1 (DOCX 179 KB)

Supplementary file2 (XLSX 18.4 KB)

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