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Using milk vetch (*Astragalus sinicus* L.) to promote rice straw decomposition by regulating enzyme activity and bacterial community

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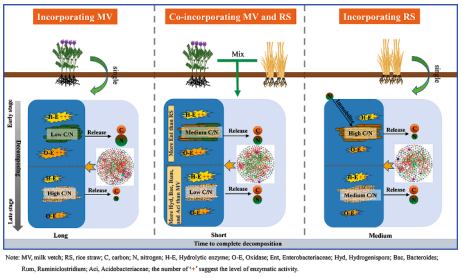
HIGHLIGHTS

- Mixing milk vetch and rice straw (MR) shortened the decomposition process.
- MR increased hydrolytic enzyme activity compared with its monospecific residues.
- MR enhanced the monosaccharide decomposing bacteria abundance relative to rice straw.
- MR enhanced the fiber decomposing bacteria abundance relative to milk vetch.
- More interconnected and competitive relations existed between the bacteria in MR.

GRAPHICAL ABSTRACT



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ABSTRACT

The present study determined the dynamic changes of enzyme activity and bacterial community in rice straw (RS) and milk vetch (MV) co-decomposing process. Results showed that mixing RS and MV promoted decomposition. The mixture enhanced β-glucosidase and β-cellobiohydrolase activities relative to its monospecific residue during the mid-late stage of decomposition. The mixture enhanced *Enterobacteriaceae* (monosaccharide decomposing bacteria) abundance during the initial stage of decomposition, and the abundance of *Hydrogenispora, Bacteroides*, *Ruminiclostridium, and Acidobacteriaceae* that could hydrolyze fiber during the mid-late stage of decomposition relative to single RS and MV, respectively, which would benefit mixture decomposition. Furthermore, more interconnected and competitive relations existed between the bacteria in the mixture. These results indicated that mixing RS and MV promoted residue decomposition by increasing hydrolytic enzyme activities and changing bacterial community. This study concluded that co-incorporating RS and MV may be recommended as a promising practice for the efficient utilization of RS resources.

1. Introduction

Rice straw is an important renewable natural resource and is abundant in macro- and micro essential nutrient elements for crop, with a total yield of about 0.20 billion tons annually in China (Nan et al., 2020). Substantial rice straw returned directly to farmland continues to

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