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REGULAR ARTICLE

Carbon and nitrogen availability in paddy soil affects rice photosynthate allocation, microbial community composition, and priming: combining continuous ^{13}C labeling with PLFA analysis

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Abstract

Background and aims Carbon (C) and nitrogen (N) availability in soil change microbial community composition and activity and so, might affect soil organic matter (SOM) decomposition as well as allocation of plant assimilates. The study was focused on interactions between C and N availability and consequences for rhizodeposition and microbial community structure in paddy soil.

Methods Rice continuously labeled in a $^{13}CO_2$ atmosphere was fertilized with either carboxymethyl cellulose (CMC) (+C), ammonium sulfate (+N), or their combination (+CN), and unfertilized soil was used as a control. ^{13}C was traced in aboveground and belowground plant biomass, soil organic matter, and microbial biomass. Microbial community composition was analyzed by phospholipid fatty acids (PLFAs).

Results +CN application led to a higher yield and lower root C and N content: ^{13}C assimilated in shoots increased by 1.39-fold and that in roots decreased by 0.75-fold. Correspondingly, after +CN addition, ^{13}C from rhizodeposits incorporated into SOM and microorganisms decreased by 0.68-fold and 0.53-fold, respectively, as compared with that in the unfertilized soil. The application of +C or + N alone resulted in smaller changes. CMC led to a 3% of total N mobilized from

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