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C and N availability in soil affects photosynthate allocation by rice, N uptake and microbial community structure: combining 13C and 15N labeling with PLFA analysis

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Organic carbon (C) and mineral nitrogen (N) fertilizers are frequently used in traditional rice cultivation, but little is known about microbial community dynamics and rhizodeposits' utilization in paddy soils. For the first time, we used carboxymethyl cellulose (CMC) as analog of straw, manure and plant residues to evaluate long-term C release for priming stimulation, and traced the fate of rice rhizodeposits in paddy soils under simultaneous CMC and N fertilizer application. Rice continuously labeled in $13CO_2$ atmosphere was fertilized with ether CMC (+C), 15N labeled ammonium sulfate (+N), or their combination (+CN), and unfertilized soil was used as a control. 13C and 15N were traced in above- and belowground plant biomass, soil organic C and N, and microbial biomass. Microbial community structure was studied by phospholipid fatty acid (PLFA) analysis.Simultaneous application of organic C and mineral N into soil led to plant and microenvironmental changes via decrease of photosynthates (13C) allocation to roots as compensation for higher aboveground yield. As a result of decreasing photoassimilates in roots, fewer rhizodeposits were incorporated into microorganisms, following with less 13C in SOM. Less belowground allocation of assimilates decreased 13C incorporation in MB and SOM, and resulted in lower total PLFA, higher G+/G- ratio, as well as suppression of functional microbial groups, such as Pseudomonas, G- bacteria and fungi