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The soil microbial community composition and soil microbial carbon uptake are more affected by soil type than by different vegetation types (C3 and C4 plants) and seasonal changes

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This study investigates the influence of different vegetation types (C3 and C4 plants), soil type and seasonal changes on the soil microbial biomass, soil microbial community composition and soil microbial carbon (C) uptake. We collected soil samples in winter (non-growing season) and summer (growing season) in 2012 from an experimental site cropping C3 and C4 plants for 6 years on two different soil types (sandy and clayey). The amount of phospholipid fatty acids (PLFAs) and their compound-specific δ13C values were used to determined microbial biomass and the flow of C from plants to soil microorganisms, respectively. Higher microbial biomass was found in the growing season. The microbial community composition was mainly explained by soil type. Higher amounts of SOC were driving the predominance of G+ bacteria, actinobacteria and cyclic G- bacteria in sandy soils, whereas root biomass was significantly related to the increased proportions of G- bacteria in clayey soils. Plant-derived C in G- bacteria increased significantly in clayey soils in the growing season. This increase was positively and significantly driven by root biomass. Moreover, changes in plant-derived C among microbial groups pointed to specific capabilities of different microbial groups to decompose distinct sources of C. We concluded that soil texture and favorable growth conditions driven by rhizosphere interactions are the most important factors controlling the soil microbial community. Our results demonstrate that a change of C3 plants vs. C4 plants has only a minor effect on the soil microbial community. Thus, such experiments are well suited to investigate soil organic matter dynamics as they allow to trace the C flow from plants into the soil microbial community without changing the community abundance and composition.