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Soil organic matter decomposition is modulated by rhizosphere process at optimum moisture condition

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Soil moisture has direct effects on microbial activity and Soil Organic Matter (SOM) decomposition. However, it is unclear if the presence of low molecular weight organic compound alters these responses through rhizosphere processes. We studied SOM decomposition with or without 14C glucose in rhizosphere and Non-Rhizosphere soils. Two sets of soils (having maize or no plants) were maintained at 35% (drought) and 70% (optimum) water holding capacity for four weeks. The soils having plants were grouped into rhizosphere soil (+R) or root removed manually (-R), whereas the no plants soil was considered as non-rhizosphere soil (NR). These treatments i.e. +R, -R and NR from optimum and drought condition incubated with or without 14C glucose for two months. Increases in soil-derived CO2-C efflux in the presence of plants roots both at optimum and drought conditions were observed. In glucose amended soil, the presence of roots had increased the $14CO_2$-C efflux. On average, the CO_2-C efflux was in order of +R>-R>NR. Total Microbial Biomass Carbon (MBC) decreased with roots presence in glucose amended treatments in optimum condition compared to drought conditions. The CO_2-C efflux, $14CO_2$-C efflux, and 14C recovery in MBC was greater in optimum than drought soils. The response to soil moisture was apparent for SOM decomposition between rhizosphere and NR soils, possibly by production exudates from roots. These roots exudates may also have become effective in stimulating microbial decomposition in optimum water condition. These findings indicate that optimum moisture condition can modulate rhizosphere effects on SOM decomposition.

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