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Legume presence reduces the decomposition rate of non-legume roots, role of plant traits?

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Plant litter traits are known to play an important role in the rate of litter decomposition and mineralization, both for aboveground and belowground litter. However also the biotic and abiotic environment in which the litter decomposes plays a significant role in the rate of decomposition. The presence of living plants may accelerate litter decomposition rates via a priming effects. The size of this effect is expected to be related to the traits of the litter. In this study we focus on root litter, given that roots and their link to ecosystem processes have received relatively little attention in trait-based research. To test the effect of a growing legume plant on root decomposition and the role of root traits in this we used dead roots of 7 different grassland species (comprising grasses, a forb and legumes), determined their C, N, P content and quantified litter mass loss after eight weeks of incubation in soil with and without white clover. We expected faster root decomposition with white clover, especially for root litter with low N content. In contrast we found slower decomposition of grass and forb roots which were poor in N (negative priming) in presence of white clover, while decomposition rates of legume roots were not affected by the presence of white clover. Overall we found that root decomposition can be slowed down in the presence of a living plant and that this effect depends on the traits of the decomposing roots, with a pronounced reduction in root litter poor in N and P, but not in the relatively nutrient-rich legume root litters. The negative priming effect of legume plants on non-legume litter decomposition may have resulted from preferential substrate utilisation by soil microbes.