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“Development on the margin”

## Fate of Particulate and Dissolved Organic Matter in Soil N Mineralisation

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### Abstract

The transformation of insoluble organic N via particulate and dissolved organic matter (POM and DOM) into inorganic N may represent the bottle neck mechanism in N mineralisation. However, it is unknown how POM fractions are related to DOM pools, and how these particulate and dissolved pools are quantitatively involved in N mineralisation. To understand and quantify the fate of these pools in N mineralisation, we conducted an incubation experiment with  $^{15}\text{N}$  labeled radish residues to trace the flow of  $^{15}\text{N}$  through the different N pools. POM was fractionated with density fractionation as light and heavy fraction (LF and HF). The dissolved organic matter fraction was collected using a centrifugal drainage technique and subsequently separated into a bioavailable and recalcitrant fraction. The enrichment of  $^{15}\text{N}$  in POM, DON and inorganic N along with their concentrations were examined to identify their role in N mineralisation. Our analysis showed that neither DON nor POM function as a distinct N source fraction in soil. The collected DOM was predominantly recalcitrant (80%), suggesting that the bioavailable DOM fraction cannot be measured with current sampling techniques. The concentration of DOM strongly increases upon incorporation of crop residues, but diminish sharply within a few days. Our results also suggest that the DOM fraction is heterogeneous in composition; the most bioavailable part is consumed within a few days whereas the remaining part is fairly constant. Moreover, the mineralisation rate of crop residue increased with incubation time but the  $^{15}\text{N}$  enrichment of DON showed gradual decrease in time. The gradual decrease of  $^{15}\text{N}$  enrichment in DON indicates that there was no change in their inputs. Hence these results suggested that a change in the turnover rate of DON was not associated with the N mineralisation rate of crop residue. From these results, we concluded that the main flow of decomposed N from residue did not pass or may not necessary to pass via the DON pool. Further research should focus on bioavailable fraction analysis.

**Keywords:**  $^{15}\text{N}$  enrichment, bioavailable fraction, dissolved organic carbon, dissolved organic matter, dissolved organic nitrogen, particulate organic matter