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# Interactive effects of C, organic N, and inorganic N on SOM mineralization

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The processes governing soil organic matter (SOM) mineralization are not yet fully understood, despite considerable interest in the topic. Mechanistic theories of microbial activity often point to interactions between carbon (C) pools and other nutrients, notably nitrogen (N). The N-mining hypothesis is a well-known example, which claims that N-limited microorganisms mineralize SOM to access the N contained within. This could elegantly explain why an increase in available carbon often accelerates mineralization of SOM, i.e. the priming effect. The hypothesis predicts a robust positive relationship between priming and C:N ratio of the added organic substances, and we therefore tested this expectation.

Soil samples from an agricultural Luvisol were incubated in a three-week, full factorial experiment, amended with organic carbon sources (glucose, alanine and no addition), at three levels of C addition (none, 25% and 50% of extractable MBC), and three levels of inorganic N to match the organic N provided by alanine. Isotopic labelling (14C and 15N) was used to trace added C and N in the evolved $CO_2$, soil solution and microbial biomass.

Both glucose and alanine induced accelerated SOM mineralization. Alanine's low C:N ratio did not prevent it from causing priming, and inorganic N forms had little effect on SOM mineralization. Our results were therefore inconsistent with the predictions of the N-mining hypothesis. Instead, the dynamics of the observed priming indicated that other mechanisms were more important, closely related to the mineralization of the added substances. Co-metabolism of SOM and apparent priming by pool substitution were more consistent the observed priming effects.

These new experimental results are supported by an analysis of literature. We demonstrate that the simple C:N stoichiometric theory of N mining is insufficient to explain the role of N in SOM mineralization. Other mechanisms must be included in explanations of SOM priming.