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Nitrogen addition drives decomposition rates in Mediterranean ecosystems via changes in soil properties and microbial attributes

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Although anthropogenic nitrogen (N) deposition has been identified as a major threat to biodiversity and ecosystem functioning in Mediterranean environments, little is known on the role of soil properties and microbial attributes in mediating the response of soil organic matter (SOM) decomposition to N inputs. Here, we used Structural Equation Modeling (SEM) to evaluate the direct and indirect effects of N inputs on SOM decomposition rates across different N loads and three Mediterranean semi-arid ecosystems. Our SEM showed that soil ammonium availability decreases soil pH leading to a reduction of the fungi/bacteria ratio and to an increase in soil enzymatic activity, whereas it also has a negative direct and mayor effect on soil decomposition rate. This increase in soil enzymatic activity, which was conditioned not only by soil pH but also by the fungi/bacteria ratio and inorganic N content, had a positive direct effect on the soil decomposition rate. Together, our results suggest that changes in soil properties and microbial attributes linked to N additions can affect the SOM decomposition rates across three regions from the Mediterranean Basin. These findings improve our understanding of the links between soil chemical properties, microbial communities and function in Mediterranean ecosystems, especially in the context of anthropogenic N enrichment.