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How agroforestry systems influence the abundance of nitrogen-cycle contributing microbial genes under Mediterranean conditions?

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How agroforestry systems influence the abundance of nitrogen-cycle contributing microbial genes under Mediterranean conditions?

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ABSTRACT

Agroforestry systems represent cropping systems in which woody crops are intercropped with alley crops to increase land productivity and enhance the delivery of ecosystem services. Avoiding bare soils in the alleys and cultivation of different annual or perennial species, with shifts in tillage and/or irrigation patterns, will have an influence in organic matter turnover and nutrient cycling, mostly carbon and nitrogen, mediated by soil microbial communities. The ability of the soil to conduct a healthy relation with the microbiome and the crops is one of the most important soil quality indicators. In this study, soil samples from two different case studies where different

diversification systems were applied are examined in perspective of ammonia oxidizing (amoA) and denitrifying (nirK and narG) gene abundances through quantitative-PCR assays to assess how nitrogen cycle can be modified by agroforestry systems compared to tree monocultures. The first case study included an almond orchard intercropped weather with *Capparis spinosa or Thymus hyemalis*. The second case study represented a mandarin orchard intercropped with a rotation of fava bean and vetch/barley or a rotation of several vegetables and vetch/barley. Abundances of amoA, nirK and narG genes significantly decreased in all intercropped systems with respect to monocultures. Thus, the special root-microorganisms and plant-plant interactions in the diversified systems contributed to soil N-cycle by decreasing the functional gene abundances. Decreasing nitrification and denitrification through management is desirable to decrease N losses and increase N fertilizer use efficiency. Thus, agroforestry systems seem more efficient in N turnover than tree monocultures where alleys remain bare most of the year.