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Influence of management practices on microbial nitrogen cyclers in agricultural soils

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Agricultural land management has great influences on soil properties, in particular on microbial communities, due to their sensitivity to the perturbations of the soils. This is even more relevant in Mediterranean agricultural areas under semi-arid conditions. The Mediterranean belt is suffering from an intense degradation of its soils due to the millennia of intense land use and due to unsustainable management practices. As a consequence this area is suffering from a depletion of N content. In this work we investigated the effect of several traditional agricultural management practices on specific functional groups related to the nitrogen cycle in the soil. A field experiment was performed with orchard orange trees (citrus sinesis) in Eastern Spain to assess the long-term effects of ploughing with inorganic fertilization (PI) and ecological practices (EP) (chipped pruned branches and weeds as well as manure from sheep and goats) on microbes that can undertake nitrogen fixation and denitrification. Nine samples of soil were taken from every treatment, near the drip irrigation point and in a zone without the influence of drip irrigation (between trees row), and total DNA extracted. DNA samples were stored at minus-20ºC to be analysed by qPCR. Microbial populations involved in the N biochemical cycle were analysed by targeted amplification of key functional biomarker genes: the abundance of nifH (nitrogen fixation), nirS, nirK and nosZ (denitrification) detected by quantitative PCR (qPCR) has shown significant differences between treatments with higher abundance of all four genes in soils from ecological agricultural treatments. This may indicate that the ecological treatment created conditions that are more suitable for N cyclers in the soil and a better fertility and quality status of these soils.