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Microbial Performance in Soils of a Sub-Tropical Mountain Oasis in Oman Abandoned for Different Time Periods

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Abstract

Little is known about the agricultural sustainability of the millenia old mountain oases in northern Oman. To elucidate the coherence between the length of a fallow period and microbial performance, samples of 11 terrace soils abandoned for different time periods were collected *in situ*. These samples were transferred to Germany, rewetted and incubated for 30 days in the laboratory. The best coherence between estimated fallow age and soil microbial properties was revealed by the microbial biomass C" to" soil organic C ratio, which declined with decreasing availability of substrate to the microorganisms. Similar close relationships to the estimated fallow age could be drawn from the microbial biomass N-to-total N ratio and the contents of microbial biomass C and biomass N. Poor indicators of fallow age were all soil organic matter related properties, such as the soil organic C content or the soil C-to-N ratio. During the 30 day incubation following rewetting, relative changes in microbial activity (respiration, N mineralisation, N fixation) and biomass (C and N) indices were similar for the 11 terrace soils. The decline of a certain microbial community was reflected by increasing concentrations of extractable organic C and organic N in combination with a decreasing concentration of inorganic N. Growth was indicated by the opposite behaviour of all three fractions. This study was part of a larger project focusing on the sustainability of oasis systems, especially with respect to the question of how the current levels of agricultural inputs affect C and nutrient balance under regular irrigation and high ambient temperatures.

Keywords: Arid climate, CO_2 evolution, fallow, microbial biomass, N"=mineralisation, rewetting

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