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DIMENSION AND STRUCTURAL TRAITS OF SOIL MICROPORES IN CULTIVATIONS DIFFERING IN THE DURATION OF ORGANIC MANAGEMENT

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Abstract

The objectives of this study were to investigate: a) whether the duration of organic farming influences the dimension, shape and geometry (fractal dimension) of soil micropores (<50μm) and b) for relationships of morphometric traits with certain chemical and biochemical soil variables (microbial biomass, N- and C-mineralization rates, NH_4^+, NO_3^-, organic C and N, extractable P, Mg^{+2}, K^+, Ca^{+2}). We compared soil micromorphometric traits (area, perimeter, compactness, solidity, eccentricity) among fields with different duration of organic farming (2 (O2), 3 (O3), 5 (O5), and 6 years (O6)): these were planted with *Asparagus officinalis* and one was conventional cultivation (CV). No significant differences were observed among the morphometric traits of all fields. However, the soil of the older organic areas (O6, O5 and O3) was characterized by small-sized pores (<10 μm) while the newest (O1) and the conventional field were characterized by medium-sized micropores (10-20 μm). The fractal dimension D_2 of the larger pores was found to be significantly higher in O2 and O3 fields, indicating larger outline irregularity for these particular pores. Higher fractal dimension could be related to more heterogeneous distribution of the microbial community in space. All micropores were correlated with the concentration of soil mineral nutrients (Mg^{+2}, K^+, Ca^{+2}). In the small pore size category (≤10 μm), N-microbial and NO_3^- concentrations, parameters involved in the nitrogen cycle, were found to be correlated to the structure characteristics. Taking into account that the three older organic fields are characterized mainly by small sized pores (≤10 μm), it is suggested that improved soil quality is mainly related with the N-cycle.

Key words: fractal dimension, image analysis, micromorphometric traits, soil thin sections

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