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Soil organic matter, microbial carbon pools and enzymatic activity in differently managed agricultural systems

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Soil is a vital living system able to fulfil all its function. Agricultural productive systems impact on soil carbon reservoirs, microbial activity and diversity penalizing soil quality and affecting its performing capacity. In this study we present results obtained by the Italian national research project "SoilSink" with the aim to determine if management practices modified organic matter meant as humification processes, microbial carbon pools and microbial activity in terms of C mineralization rates and enzymes.

The trial compared two different management system: conventional and minimum tillage. Soil samples were collected at (0-40) cm depth for conventional system and at (0-20) and (20-40) cm depth for minimum one. Experimental design included a control plot (no fertilized) and a fertilized plot (90 kg per hectare). Five field replicates each plot were carried out.

Determinations concerned metabolic quotient, qCO_2, mineralization quotient, qMin, and microbial quotient, qMic. They were determined by measures of total organic carbon, C_{org}, microbial biomass carbon, C_{mic}, respiration of soil (basal, C_{bas}, and cumulative, C_{cum}). Moreover organic carbon reservoirs were evaluated by determining extractable, C_{ext}, and humified, C_{hafa}, carbon, and related humification parameters. Enzymes determination were chosen on their relevance in the C (β-

cellobiohydrolase, N-acetyl- β -glucosaminidase, β -glucosidase, α-glucosidase), N (leucine-aminopeptidase), S (arylsulphatase) and P (acid phosphatase) cycles.

Results showed an higher content of total organic C (C_{org})and stable fraction (Humin and C_{hafa}) in minimum tillage, especially in (0-20) cm layer, respect to conventional one.

Lower microbial biomass C and mineralization activity in conventional system joint to high values of specific respiration activity put in evidence a possible stress condition for soil microbial community.

The activity of hydrolytic enzymes was strictly related to the amount of organic matter in soil and increased significantly in minimum tillage with respect to conventional one in the (0-20) cm layer.