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Fractionation and characterization of soil organic carbon during transition to organic farming

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The transition from conventional to organic farming is the most difficult period faced by organic growers as it could be characterized by unstable conditions, such as nutrient availability, production reductions, mineralization extents. As soil organic matter (SOM), specifically soil organic carbon (SOC), is known to play important roles in maintenance and improvement of many soil properties, it is important to define its changes during the transition period. Total SOC might not be the suitable tool to track the changes in organically based soil fertility within a 3- to 5-yr transition period. Labile fractions that are important for nutrient cycling and supply are likely to be controlled by management to a much greater extent than is total SOM. Two field experiments, in south of Italy, were established in 2009 to study the changes in SOC during transition to organic farming. Experiments included a cereal/leguminous rotation with triplicates treatments of permitted amendments (compost and fertilizers). Soils were sampled at the beginning of the project, and after each crop harvest in 2010 and 2011. A sequential fractionation procedure was used to separate different SOC-fractions: light fraction (LF), two size classes of particulate organic matter (POM), mobile humic acid (MHA) and Ca++ bound humic acid (CaHA). Isolated fractions were quantified and analyzed for their content of C, N, carbohydrates and amino compounds fingerprints. The obtained results showed that compost application contributed to significantly higher quantities of LF, POM and MHA than did fertilizers application. Carbohydrates content decreased in LF while increased noticeably in POM and slightly in MHA fractions, which indicates that decomposing materials are converted, within the time span of humification, from young fractions into more mature fractions. Amino compounds were found to provide up to 40% of total soil N with a major contribution of the humified fractions, MHA and CaHA. The utilized fractionation procedure was found to be efficient in studying SOC changes in short term course.