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Organic matter characterisation of amended soils under crop rotation in Mediterranean area

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Intense agricultural activities can lead to changes in chemical, physical and biological soil properties, with the consequent deterioration of soil quality (Doran e Parkin, 1994; Bell et al., 1998). This is particularly evident in Mediterranean areas, where the hot climate and water scarcity emphasize the risk of C-sink decrease, causing land desertification on short time (Trinchera et al., 1998; Trinchera et al., 2001).

It is well known the role played by soil organic matter in soil quality (Benedetti e Trinchera, 1999; Trinchera et al., 2001). Actually, organic matter and, more specifically, all attributes linked to soil C turnover, are usually recommended as indicators in any minimum data set for soil quality evaluation (Monreal et al., 1997; Tittarelli and Canali, 2002). Among the different approaches to front the loss of soil organic matter, the use of high quality composts obtained from different organic wastes (i.e. agro-industries, intensive livestock, municipal solid wastes), characterised by high stability of organic matter, could represent an winning strategy (Baldoni et al., 1996; Singh et al., 1998; Paustian et al., 2002; Ryan et al., 2002; Canali et al., 2003).

The aim of this paper was to verify if repeated applications of compost to an agricultural soil of Central Italy under crop rotation could influence organic matter content and/or improve soil humification.

A randomised blocks system, based on 5 years' crop rotation (*Triticum durum L.* - *Beta vulgaris L.* - *Triticum durum L.*- *Medicago sativa L.*, 1^{th} year - *Medicago sativa L.*, 2^{th} year), was yearly added with different doses of compost from municipal organic

residues: 100, 200, 300 and 400 q $\times ha^{-1} \times year^{-1}$, respectively. After 10 years of amendment, soil was investigated in relation to soil organic matter content and quality, in comparison with a monoculture of *Triticum durum L.*, yearly added with straw.

Soil organic matter was studied by fractionation of humic compounds, by determining total organic C, total extractable C in alkaline environment, humic and fulvic acids C and the related humification parameters. Soil purified humic substances were studied by isoelectric focusing technique (IEF) and further characterised by quantitative elaboration of IEF peaks to obtain the A_s % parameter (Canali et al., 2003).

After 10 years of compost addition to soil, a significant increase of total organic C took place (+10 $\div$20 % of organic matter in soils amended with respect to those no treated with compost). This increase was proportional to the applied compost doses, being not influenced by agricultural system (crops rotation vs. wheat monoculture). Nevertheless, repeated amendment did not significantly influence the amount of soil humic matter and humification parameters. On the contrary, compost addition increased the quality of humic material, as attested by the increased value of A_s %, corresponding to an increase of the less acidic and more stable humic substances. Moreover, the IEF technique showed that soil under 10 years' of *Triticum durum L.*, repeatedly added with wheat straw, had the lowest values of A_s % (that is less humified material), probably due to an excessive organic input with high C/N ratio (high content in lignocellulosic compounds), that the soil system did not succeed in converting to humic matter.

Obtained results suggested that compost application to soil represents, especially in Mediterranean environment, an advantageous agronomic strategy to control soil organic matter loss in crops rotation systems, since it contributes to guarantee the maintenance of soil organic matter pool on long term by increasing the humic matter stability and therefore its resistance to biological degradation.