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Effects of sewage sludge and municipal waste compost on labile organic C fractions of agricultural Mediterranean soils and its influence on microbial activities

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The influence of labile sources of C added with sewage sludge (SL) and municipal waste compost (MWC) amendments on soil microbial activity were determined in two different long-term field experiments. SL was applied to a *Calcaric regosol* at a rate of 40 t ha^{-1}. MWC experiment was performed in a *Calcaric luvisol* at two rates of 20 (C20) and 80 (C80) t ha^{-1}. These doses of MWC were compared with a mineral fertilization and manure at a rate of 20 t ha^{-1}. Both soils were cropped with spring barley under semi-arid conditions. In general, the addition of SL and MWC caused significant changes in water soluble organic C (WSOC), carbohydrates and phenolic compounds contents in soil, which were significantly and positively correlated with increases in microbial biomass C (MBC), soil basal respiration, metabolic quotient (qCO_2) and dehydrogenase and β-glucosidase enzyme activities. The revitalization of all microbial parameters studied may be attributed to the great input and bioavailability of labile organic C added with these amendments, which were used as energy sources by soil biota. However, in the SL experiment, these effects were only significant in soils that received the organic treatment more recently; meanwhile the residual effects on these parameters three years after its application were very similar to the unamended soil, as a consequence of intensive mineralization processes under the environmental conditions in the studied area. MWC showed a more prolonged residual effect on these parameters, but it was only significant in the C80 treatment 9 years after its application. Cumulative applications of organic materials in MWC experiment increased all microbial parameters in soil, especially with manure. This could

be attributed to the microbial stimulation by the labile organic C and was positively correlated with increases in dehydrogenase and β-glucosidase activities, indicating a global reactivation in the microbial metabolism in soil as a result of the mineralization of biodegradable C fractions contained in the amendments. Organic amendments also increase heavy metals contents in soil. However, the presence of available heavy metals due to the addition of these materials at high doses did not negatively affect any of the microbial parameters studied.