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# Effects of composted municipal sewage sludge on microbial biomass, basal respiration and fluorescein diacetate hydrolysis

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In the European Union, the annual production of sewage sludges reached about 9•106 tons in 2006, considering 15 member countries [1]; sewage sludges is rich in organic carbon (40-70% on dry matter), phosphorous (3%), nitrogen (1.5%) and other nutrients [2]. On the other hand, soils, especially in the Mediterranean area, are often subjected to severe degradation processes accompanied by a decline of soil organic matter content which adversely affects soil fertility; the use of organic amendments allows restoring soil organic matter content and its physical, chemical and biological functions [3]. Therefore the agricultural use of sewage sludges could be an interesting way to convert a waste into a resource by supplying organic matter and nutrients to cultivated and degraded soils according to an ecological approach.
However, sewage sludges may contain contaminants, such as heavy metals, patogens and organic pollutants, so they must be subjected to a composting process in order to obtain chemical stabilization and biological maturation [4].
The aim of this work was to study, on a laboratory scale, the effects on soil fertility of two biosolids obtained from composted municipal sewage sludges mixed with rice husk. The products, A deriving from an anaerobic and B from aerobic treatment plants (HERA SpA, Ravenna, Italy), were mixed with rice husk in the ratio 1/1 v/v, corresponding to a percentage of sludge of 85% w/w and then subjected to stabilization in a forced ventilation plant for 30 days and curing in a static pile for at least 30 days.
These biosolids were characterized and then, after drying, milling and sieving, applied to a typical Italian sandy loam soil (Aquic Xeropsamment) in order to have a final nitrogen concentration of 50 mg/kgdm; the soils were incubated in 500 mL plastic pots with 250 g (dm), at 66% WHC and 25 °C; the experiment lasted 14 weeks. At each sampling time, analyses were made to determine nitrogen mineralization, soil microbial biomass content, fluorescein diacetate hydrolysis and organic carbon mineralization.
The aerobic product B was able to increase microbial biomass concentration of about 20% with respect to the unamended control, while the anaerobic biosolid A did not had important effects on this parameter.
As to total enzymatic activity, determined through fluorescein diacetate hydrolysis, B showed a higher activity at each sampling time, finally increasing it of 15% with respect to the control, while this value was of about 10% for A, suggesting a higher stability for the anaerobic product.
Indeed basal respiration confirmed this hypothesis, as the aerobic product B showed higher carbon mineralization and had a higher respiration rate than the anaerobic product A that, however, increased the respiration rate with respect to the unamended control.
The biosolids employed in this work, obtained from municipal sewage sludges composted with rice husk and containing a high percentage of sludge, did not show negative effects on microbial biomass content, enzymatic activities and carbon mineralization. Therefore on the basis of the results here obtained both products, A and B, could be suitable for soil amendment, especially the anaerobic biosolid A, which seems to have higher stability.

[1] Milieu Ltd, WRc and RPA, 2008
[2] Laturnus et al., 2007
[3] Fernandez et al., 2009
[4] Pavan Fernandes et al., 2005