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Application of an early monitoring tool to assess the effects on soil microbial biomass of organic fertilizers and soil conditioners in different soils

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Background & Objectives

The impact on soil microbial biomass of stripped digestate (SD) [1], digestate (D), and manure (M) compared to compost (CO), "matured" manure (MM) and biochar addition (B) [2] is poorly understood. The aim is the test of an early tool to monitor the microbial responses of different kind of soils after application of soil conditioners or organic fertilizers.

Materials & Methods

Mesocosms was the chosen approach to determine soil microbial biomass and activity. The organic fertilizers were added at different nitrogen agronomic doses: 340 and 170 kg N ha⁻¹ in arable soils (S1, S3) and 85 kg N ha⁻¹ in vineyard soil (S2). Chemical properties (C, N, P, NO₂ extracts), soil microbial biomass index (dsDNA) [2] and 9 different enzymes of C-, N-, P-, S- cycle were measured after 2, 7, 14, 30 days. Emissions (CO₂, N₂O) were determined through respirometry.

Results & Discussion

The adopted methodology is suitable to identify specific responses of soil biomass. As regard the values of C-N-P extracts they were similar in the three soils as well as their trend. In S1 and S3, nitrogen values of D were higher than each other treatment at both doses (60.41 - 79.34 µg/g). D, SD and M caused higher N₂O emissions (SD is 1.02 µg/g). M sample had the highest CO₂ emissions (387.39 µg/g), while D, SD values were very similar to C and MM. After 30 days dsDNA values differed due to the kind of soil: 62.3 (S1), 23.6 (S2) and 9.13 (S3) µg/g. The enzyme activities showed the same trend. In soil with higher dsDNA values (S1), both soil microbial index and enzymes activities decreased. The addition of organic fertilizer and B determined the decrease of N₂O emissions and the increase of phosphatase activities.

Conclusion

To protect and preserve the soil ecosystem and its fertility, it is important to know the effects on microbial biomass of different organic fertilizers and soil conditioners. The chosen methodology is a very early tool to monitor and to define a specific response pattern for each treatment.

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