

CO₂ dynamics and priming effect of different Hungarian soils based on laboratory incubation experiment

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Soil processes are particularly important in terms of global carbon cycle, as soils globally contain approximately 2000 Gt carbon, which is higher than the carbon stock of the atmosphere and the terrestrial ecosystem together. Therefore small alterations in the soils' carbon sequestration potential can generate rapid and significant changes in the atmosphere carbon concentration. Soil texture is one of the most important soil parameters which plays a significant role in soil carbon sequestration. Fine textured soils generally considered containing more microbial biomass, and having a lower rate of biomass turnover and organic matter decomposition than coarse textured soils. In spite of this, several recent studies have shown contradicting trends.

Our aim was to investigate the influence of the basic soil properties (texture, pH, organic matter content, etc.) on the biological and physicochemical processes determining the soil CO₂ emission. Thirteen Hungarian soil samples (depth of 0-20 cm) were incubated during six months. The samples are mainly high clay and organic matter content forest soils, but two forest soils developed on sand were also collected. The soils are derived from C3 forests and C3 croplands from different sites of Hungary. C4 maize residues were added to the soils in order to get natural ¹³C enrichment for stable isotope measurement purposes and for quantifying the priming effect caused by the crop residue addition. The temperature (20°C) and humidity (70% field capacity) conditions were kept constant in an incubator. The soil respiration was measured at specified intervals (on day 3, 8, 15, 30, 51, 79, 107, 135 and 163) and trapped in 2M NaOH and quantified by titration with 1M HCl.

Our first results based on the cumulative CO₂ respiration values show positive priming for all type of soils. Results confirm the statement that in certain cases fine textured soils release more CO₂. To determine which soil properties influence the most the soil CO₂ emission, the linking among the mathematical model parameters and the soil properties would be useful.

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