

The dynamic of glyphosate mineralization in compost amended soil

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Abstract

Glyphosate, n-phosphonomethyl glycine, is one of the most commonly used herbicides in the world. In agriculture is widely used with genetically modified glyphosate tolerant crops, but is also used in yards, gardens and other nonagricultural areas. Glyphosate is relatively immobile in most soil environments as a result of its strong adsorption to soil particles. In this work the dynamic of glyphosate mineralization in compost amended soil has been studied under controlled conditions. The dynamic of glyphosate mineralization until the stage CO₂ was analyzed using liquid scintillation counter TRIATHLER and labelled phosphonomethyl-¹⁴C-glyphosate. Substrates used were black chernozem, vertisol, gleysol and phaeozem with different characteristics and treated with compost at concentrations of 2500 mg/kg and 5000 mg/kg. Glyphosate solution (both labelled and non-labelled) was added to the 25 g soil sample in each biometry flask giving an initial herbicide concentration of 1,5 ppm and initial radioactivity of 2μCi in soil and incubated at 20⁰C during 40 days. The mineralization curves of ¹⁴CO₂ accumulated were compared during 40 days. Also, the mineralization curves of autoclaved soil were analyzed.

The results showed that the mineralization curves of glyphosate had only two phases, the initial rapid phase followed by a slow final phase, when the curves attained plateaus. The compost did not stimulate intense mineralization of glyphosate by microorganisms in the case of black chernozem and vertisol, but the accumulated ¹⁴CO₂ increased with compost in the case of gleysol and phaeozem soil. Autoclaving did not completely eliminate microorganisms but just reduced them.

Key words: glyphosate mineralization, liquid scintillation, compost