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Characterizing Rhizodegradation of the Insecticide Bifenthrin in Two Soil Types

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ABSTRACT

Rhizodegradation is a process by which plant-supplied substrates stimulate microbial populations in plant root zones (rhizospheres) to cause removal of undesirable levels of contaminants in soil. This study characterized rhizodegradation of the insecticide bifenthrin in Armour silt loam and Sullivan fine sandy loam soils that were planted with switchgrass, big bluestem, and alfalfa. After six weeks in soils, plate dilution frequency assays (PDFA) of bacterial populations were higher in all planted soils than in unplanted ones. Planted Sullivan soils contained higher bacteria than corresponding Armour soils and alfalfa rhizospheres of both soil types contained highest bacteria. Bacterial populations generally increased between week 6 and week 10, before declining in each treatment at week 12. Carbon utilization patterns (CUP) of bacterial communities, measured as color development on BIOLOG plates, were higher in planted soils than in unplanted ones. Principal Component Analysis (PCA) constructed patterns based on different extents of color development; these patterns were used to relate microbial communities in the different treatments. Gas chromatography (GC-ECD) showed that significantly more bifenthrin dissipated in planted soils than unplanted ones. Different levels of bifenthrin were recovered in planted soils but the differences were generally not significant. Data are being evaluated further to provide a basis for the development of strategies for enhancing rhizodegradation of soils contaminated with bifenthrin.

KEYWORDS

Rhizodegradation, Microbial Community, Substrate Utilization Patters, Biolog, Bifenthrin, Pesticide Dissipation

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