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Enhancing Glyphosate Biodegradation via Developed Microbial Biofilms

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Glyphosate, N-(phosphonomethyl)glycine, is a nonselective herbicide which is used extensively in modern agriculture to control the growth of broad-leafed weeds and long grasses. It causes acute and chronic toxicity to mammals while effecting on non-target organisms. Its overall environmental impact is still not fully understood. Therefore, this study was conducted to establish an efficient method for biodegradation of glyphosate residuals in agricultural ecosystems. Using rice (*Oryza sativa* L.) as the test plant, soil pots with the plants were treated with a developed microbial biofilm, the biofilm with glyphosate, glyphosate alone, and untreated pots served as the control. The experiment was arranged in a Completely Randomized Design (CRD) with triplicates. Two weeks after applying glyphosate, plants were harvested, and plant height, leaf number and dry weights were measured. Then equal portions of crushed and ground plant materials were subjected to organic solvent extraction (70% acetone:30% water). Thereafter, the crude was subjected to Fourier transform infrared (FTIR) spectrophotometric analysis. Leaf number, dry weight and plant height of the biofilm with glyphosate treatment were significantly higher than those corresponding to glyphosate treatment alone. This could be due to reduction of glyphosate level via biodegradation by the biofilm microorganisms. Microbial biofilm application evidently depleted glyphosate levels, as reflected from the peak reduction of the FTIR spectrum. Thus, it is clear that microbial biofilms can revive the soil microbial activity, which helps to biodegrade accumulated toxic compounds like glyphosate, and reduce the adverse consequences on the environment.