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The Effect of Crop Residues on the Dynamism of Soil Microbial Communities

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Abstract

Residue management and its recovery in soil is an available option to sustain agroecosystems especially in arid and semiarid regions. In order to investigate the effect of different residues on microbial activities, a four-replicated field experiment performed as a CRB design on wheat. Five crop residues with different C:N ratio (including cotton, soybean, alfalfa, wheat and corn) in companion with pure urea and control treatment (without residue or fertiliser) were incorporated as <5 mm particles. The rate of residue and the amount of measuring the nitrogen needed to avoid immobilisation were determined by C:N ratio and nitrogen index to provide 90 kg N ha^{-1}. The microbial biomass carbon was measured at 49, 83, 99, 127, 165 and 175 days by fumigation-extraction method. The results indicated that microbial biomass changes considerably during time without a predictable trend. Our findings revealed that the dynamism of microbial communities is highly correlated to temperature, but is not affected by soil moisture content. Also, we found that C:N ratio can not be considered as the best index to interpret biological activities during decomposition process. We found that cellulose and hemicellulose also should be analysed. Our analyses on nitrogen dynamism in wheat also showed that residues could provide nitrogen demands of the plant adequately as urea treatment. This demonstrated that using the crop residues as internal-inputs could be considered as an option to provide soil fertility. Albeit, it is important to provide nitrogen to cover the demand by microorganisms via exact calculations to avoid N immobilisation. Undoubtedly, finding the best management scenarios to optimise bioactivities in the soils will be one of the main goals to sustain agroecosystems, conserve the environment against pollutants and provide food security and safety for humans for current and next generations.

Keywords: Crop residue, decomposition, microbial community, nitrogen

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