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Sorption and degradation of 14C-Atrazine in oat straw and in Brazilian Acrisol under no-tillage

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The worldwide use of the herbicide atrazine (ATZ) resulted in its distribution in soil and aquatic systems, which lead to its prohibition by the European Union Member States. In Brazil, ATZ is still widely applied for broadleaf control in maize, soybean and sugar cane crops. Due to changing agricultural management systems from tillage to no-tillage or conservation tillage systems, information on the environmental fate (sorption/desorption and degradation) and behavior of ATZ is needed when this herbicide is applied to the straw cover in no-tillage systems. Our study evaluates the pattern of ATZ degradation in a Brazilian Acrisol used for agricultural purposes under no-tillage treatment. The incubation experiments were conducted for 85 days in order to compare the mineralization, formation of metabolites and nonextractable residues of ATZ in two soils with a different ATZ application and soil management history: cultivated soil – the soil was exposed to ATZ application for more than 10 years; native soil – the soil was collected at an adjacent area with no history of ATZ application. An incubation experiment using a layer of oat straw on the soil surface was conducted to evaluate the sorption, the mineralization, formation of metabolites and nonextractable residues formation of ATZ in the straw compared to the soil alone. First results showed higher 14C-ATZ mineralization in cultivated soil (around 86% of the total amount of 14C activity applied) in comparison to the native soil (around 8% of the amount applied) after 68 days of incubation. The water-extractable amount of 14C-ATZ directly after its application was >60% of the amount applied and it decreased during the time in both soils. However, the water-extractable amount of 14C-ATZ in the cultivated soil was lower than in the native soil due to its higher mineralization. The water-extractable metabolites detected were hydroxyatrazine and deethylatrazine. The water-extractable amount of deethylatrazine was higher than the amount of hydroxyatrazine for the native soil. These results demonstrate an accelerated ATZ degradation in a previously ATZ-treated soil due to an ATZ-adapted soil microbial population being able to rapidly mineralize this herbicide. Further results on ATZ fate and mineralization in the soils under straw amendment will be presented.