

Soil concentration of glyphosate and AMPA under rice cultivation with contrasting levels of fertilization

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Rice (*Oryza sativa*) is the world's most important crop species and occupies c. 150 mill ha. The province of Corrientes in Argentina leads the national production of rice cultivation. Glyphosate is a non-selective herbicide commonly used to control weeds. The molecule is inactivated once applied due to its adsorption in the soil, and once desorbed is degraded by soil microflora resulting in sarcosine and aminomethylphosphoric acid (AMPA) molecules. The objective of this investigation was to compare glyphosate and AMPA concentration in soil under different levels of fertilization along the growth season of the rice crop. A field experiment following a completely randomized design was carried out with four replicates. We evaluated four levels of fertilization (0-18-40): Control: 0 kg ha⁻¹, Dose 1: 120 kg ha⁻¹, Dose 2: 150 kg ha⁻¹, Dose 3: 180 kg ha⁻¹; and two levels of Glyphosate: with (Gly) or without (No) application. Four sampling moments were defined: pre-sowing (taken as reference), vegetative stage (V4, 30 days after application), in floral primordial differentiation-DPF (80 days post-application), and at physiological maturity-MF (125 days after application). Flooding was applied in V4 after sampling. The method used for determination and quantification was by ultra high-pressure liquid chromatography coupled to ESI UHPLC-MS / MS tandem mass spectrometer (+/-) (Acquit-Quattro Premier). We found that glyphosate and AMPA varied their concentration in soil according to the time of sampling. Detected levels of both molecules at pre-sowing indicate the persistence of this herbicide from earlier crop seasons. The highest concentration was measured in MF followed by V4. Interestingly, AMPA concentration showed higher values in V4 without application compared to the treatment with glyphosate application. On the other hand, in flooded soil both molecules presented a decrease in their concentration probably because of their dilution in water, increasing it again after the irrigation was suspended. The ratio between the concentration of glyphosate and AMPA molecules was positive, this means that to a greater presence of the original molecule, the greater the content of the metabolite, even after 125 days of the application of the herbicide.