

Fate of pesticides added to the soil in northeast of Santa Fe Province, Argentina.

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The use of pesticides in crop production has increased in the Northeast Santa Fe Province. This region has predominance of argiudolls, hapludalf and natracualf soils, with silt loam texture and 1.5 % of organic matter content. The main crops are sunflower, maize, cotton and sorghum. There are also extensive livestock production systems. The objective of this work was to study the presence and environmental fate of pesticides used in the agricultural systems of the Northeast Santa Fe Province. Different environmental matrices (soil, surface water and sediment) were sampled during the 2014-2015 cropping season in an area of about 180,000 ha of the “Arroyo el Rey” basin. Soil samples were collected at 0-5 cm depth in sunflower, sorghum, soybean and cotton cultivated fields. A total of 12 field plots were sampled, with glyphosate application and without glyphosate application. Water samples were collected at three locations: upper basin, medium basin, and lower basin in polypropylene bottles and stored at -20 °C until analysis. Glyphosate and AMPA was extracted from filtered water samples with a buffer solution (100 mM Na₂B₄O₇•10H₂O/100 mM K₃PO₄, pH=9) and derivatized with 9-fluorenylmethylchloroformate (1 mg mL⁻¹ in acetonitrile). Afterwards samples were analyzed using liquid chromatography coupled to a tandem mass spectrometer (UPLC-MS/MS). A multi-residue determination of pesticides other than glyphosate and AMPA was used to detect pesticides in soil, water and sediment. Hydroxy atrazine (Atz-OH) (a degradation product of atrazine) and AMPA (a degradation product of glyphosate) were founded in the 100% of the soil samples. Below 70% of occurrence frequency were detected molecules such as Imidaclopyr (63%), Glyphosate (63%), Diethyltoluamide (61%), Atrazine (22%), Fluorocloridone (13%), Imazethapyr and Acetochlor To 1%). In water samples taken during 2014 the pesticides that exceeded the threshold of 0.1 µg.L⁻¹ per molecule (European Economic Community) were AMPA (range: 0.7-0.3 µg.L⁻¹), Atrazine (range : 0,201-0,1 µg.L⁻¹), Atz-OH (range: 0.1598-0.135 µg.L⁻¹). Also in some cases, the 0.5 µg.L⁻¹ value (maximum for sum of EEC molecules) was exceeded, with ranges from 0.845 to 0.104 µg.L⁻¹. In the water taken during 2015 the concentrations of AMPA and Glyphosate were greater than in 2014 (ranges: 6,6-0,5 µg.L⁻¹ and 4.5-0,2 µg.L⁻¹, respectively). This preliminary information indicates the need to study processes such as retention, degradation and vertical transport of pesticides to understand the mechanisms by which they are present in the different environmental matrices. In addition, it is important to reduce the input of pesticides added to the environment to produce grains and fibers in this region.