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Multimatrix Environmental Risk Assessment in Argentinian Pampas watershed.

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The Pampas region is the main agricultural zone in Argentina, in which the massive pesticide application into the agroecosystems is the main causes of nonpoint source pollution of terrestrial and aquatic ecosystems. The environmental risk assessment (ERA) of pesticide detected in the environment can be assessed by comparisons with environmental quality values and reported ecotoxicological effect values for key sentinel species. In Argentina, there are scarce information about the environmental risk of terrestrial and aquatic biota due to pesticides. The objective of this study was to evaluate the presence of current-use pesticides in different environmental matrices (soils, sediments and surface water) and its ecological risk assessment implications at short and long term on terrestrial and aquatic biota in Argentinian Pampas watershed. The "Tapalqué" stream is located in Buenos Aires Province and flows from south to north through 120 km. The study zone comprised the upper part of the Tapalqué watershed with an area of approximately 2000 km2. Six sites throughout the stream edge with different land uses were sampled in October 2014 (spring), February 2015 (summer) and May 2015 (fall). Surface water grab samples, sediment and composite soil samples (the upper 5 cm) were collected at each point. The samples were analyzed using liquid chromatography coupled to a tandem mass spectrometer (UPLC-MS/MS) to detect pesticide residues. The ERA analysis were carried out throughout two approaches: Toxic Units (TU) to assess acute risk for aquatic and sediment dwelling organisms, and Risk Quotients (RQ) to assess chronic risk for aquatic and terrestrial organisms, calculating $\sum$TU and $\sum$RQ for each site/sampling event. In surface water the most frequently residues were atrazine (100%) and its metabolites (60%), imidacloprid (90%), and glyphosate and AMPA in 40% and 78% of the samples, respectively. In sediments and soils, glyphosate, AMPA, metalochlor and acetoclor were the most frequently residues detected in more than 60% of the samples. The pesticides occurrence are in concordance with that compounds used in the cultivated crops in the area (i.e. soybean, maize, wheat, barley, oats, rape and canary grass). Regarding ERA, $\sum$TU in surface water indicated no environmental acute risk for aquatic organisms ($\sum$TU<1) for any of the sites/sampling events, while in sediments only 11% of samples showed a $\sum$TU>1 indicating environmental concern. However, chronic risk (calculated by $\sum$RQ) for water organisms indicated from negligible risk ($\sum$RQ<0.01) to medium risk expected (0.1<$\sum$RQ<1) depending of the site/sampling event. In soils, 89% of samples showed a $\sum$RQ ranging between medium risk expected and expected harmful effects ($\sum$RQ>1). These results highlight about the potential toxicity of pesticides in the three matrices analyzed, mainly those related to chronic effects in aquatic and terrestrial organisms. Information arose from ERA studies could be useful to establish regulatory benchmarks for biota protection in agroecosystems.