

Dynamics of current-use pesticides in the agricultural model basin

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The southeast of the Pampas plains is a zone with intensive agricultural activities; this zone is highly irrigated by wetlands, rivers and many streams. The stream flow dynamics are strongly related to the regional humidity, mainly given by runoff water and phreatic surface level, and can change dramatically during storm events. In this sense, it is important to study the fluctuations in the loads and mass of current-use pesticide (CUPs) to examine the influence of hydrologic and seasonal variability on the response of pesticide levels. The objective of this work was to determine the maximum loads reached of \sum CUPs and mass of CUPs associated with the flow dynamic in surface waters of “El Crespo” stream. “El Crespo” stream is only influenced by farming activities, with intensive crop systems upstream (US) and extensive livestock production downstream (DS). It is an optimal site for pesticide monitoring studies since there are no urban or industrial inputs into the system. Water samples were collected monthly from October 2014 to October 2015 in the UP and DN sites using 1 L polypropylene bottles and stored at -20°C until analysis. The samples were analyzed using liquid chromatography coupled to a tandem mass spectrometer (UPLC-MS/MS). The stream flow was measured during the sampling times in both sites, covering low base-flow and high base-flow periods. The most frequently detected residues ($>40\%$) were glyphosate and its metabolite AMPA, atrazine, acetochlor, metolachlor, 2,4-D, metsulfuron methyl, fluorochloridone, imidacloprid, tebuconazole and epoxiconazole. The mean concentrations of \sum CUPs during the sampling period were $1.62\mu\text{g/L}$ and $1.66\mu\text{g/L}$ in UP site and DN site, respectively. The highest levels of \sum CUPs were $4.03\mu\text{g/L}$ in UP site during spring 2014 and $2.53\mu\text{g/L}$ in DN site during winter 2014. The mass of \sum CUPs showed a direct relation between low base flow and high base flow periods. During high base flow during spring 2014, the stream discharge showed peak of $6.16\text{ mt}^3/\text{s}$ and $6.77\text{ mt}^3/\text{s}$, in UP and DN site, respectively; where the total loads of \sum CUPs were $3.7\mu\text{g/L}$ and $2.88\mu\text{g/L}$ and the associated mass were 22.74 and $19.54\mu\text{g/s}$, in UP and DN site, respectively. During low base flow the discharge were lower than $1\text{ mt}^3/\text{s}$ and the total loads of \sum CUPs were variable between $1\text{--}3\mu\text{g/L}$, but the mass never were higher than $3\mu\text{g/s}$. The intensive rain during the spring 2014, were the mainly factor that influence the stream flow and pesticide dynamics in the model basin