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Pesticides in productive sub-basins of Argentina

José Luis Costa (1), Eduardo De Gerónimo (1,6), Claudia Vidal (2), Rosa Holzmann (3), Rocio Portocarrero (4), Laura Mas (5), Elena Okada (1), Débora Perez (6), Ana Clara Caprile (7), Tania Montoya (8), Lía Oyesqui (9), Maria Florencia Roldan (10), Cecilia Aranguren (1), Virginia Aparicio (1,6)

(1) INTA, Agronomy, Balcarce, Buenos Aires, Argentina (costa.jose@inta.gob.ar), (6) CONICET., (2) INTA, Agronomy, Reconquista, Santa Fé, Argentina, (3) INTA, Agronomy, Alto Valle, Rio Negro, Argentina, (4) INTA, Agronomy, Famailla, Tucuman, Argentina, (5) INTA, Agronomy, Este de Santiago del Estero, Sgo del Estero, Argentina, (7) INTA, Agronomy, Pergamino, Buenos Aires, Argentina, (8) INTA, Agronomy, Corrientes, Buenos Aires, Argentina, (9) INTA, Agencia de Extension Rural, Buenos Aires, Argentina, (10) INTA, Agronomy, Saenz Peñá, Buenos Aires, Argentina

Healthy soils are key to mitigate climate change and adapt to its effects, reduce forced migration of people, preserve biodiversity, improve the nutrition of the population, provide clean water and achieve food security (FAO, 2017). With rapid industrialization and modern agricultural practices, soil quality is gradually decreasing (Liu et al., 2018). The extensive and inefficient use of pesticides during the last decades led to their accumulation exceeding the capacity of self-purification of the soil with the inevitable consequence of a serious degradation of its quality (Vangronsveld et al., 2009).
In Argentina, 10 sub-basins located in different productive zones of the country were monitored (fruit trees, rice, extensive livestock and grain agriculture such as soybeans, corn, wheat and sunflower under direct sowing). Soil samples (n = 419), surface water (n = 359), sediments (n = 162) and groundwater (n =250) were extracted where possible. The samples were analyzed by liquid chromatography and mass spectrometry. Fifty pesticide molecules were analyzed.
The sum of the molecules had a maximum of 9815 μg Kg-1 in the soils sampled in this work. Recently, Neuwirthová et al. (2019) found pesticide residues from the previous growing season and evaluated whether they could be absorbed by soil organisms and by crops planted later. The authors point out that levels of $\leq$100 μg Kg-1 these pesticide residues probably do not represent a significant threat to the soil environment, the food chain and, consequently, human health. In the Argentine soils studied, 74.2% of the soil samples have a concentration higher than 100 μg Kg-1 in the sum of the molecules studied. Of the 50 molecules studied, the 3 molecules with the highest maximum concentrations were AMPA (7355 μg Kg-1) > Glyphosate (4273 μg Kg-1) > Atz-OH (1585μg Kg-1).
With regard to sediments of streams, the sum of molecules had a maximum of 5107 μg Kg-1 and 22.8% of the samples have a concentration higher than 100 μg Kg-1 in the sum of molecules studied.
Finally, 47.1 and 46.4% of surface and underground water samples respectively have a sum of molecules equal to or greater than 0.5 μg L-1.
Agricultural land is the first recipient of pesticides after its application. Even if pesticides are applied according to the regulations, only a small amount reaches its objective, while the rest represent possible environmental contaminants and short or long-term harvest products, with a wide range of possible negative impacts (Hvězdová et al., 2018). Argentina has excellent soil and climatic conditions for agricultural production. However, the dominant production system uses large quantities of pesticides that negatively affect the environment.