

Exploratory study of the behavior of glyphosate and AMPA in three profiles of a Haplustol Entish soil province of Córdoba, Argentina.

Stephania Prince¹, Raquel Murialdo¹ Hugo Pesci¹ Estela Reyna¹

¹ FCEfyN- Universidad Nacional de Córdoba, Argentina.
Email: stephaniaprince@gmail.com

Glyphosate is a broad-spectrum systemic herbicide used to kill weeds, especially annual broadleaf weeds and grasses known to compete with commercial crops. The most common formulation of Glyphosate is as isopropylamine salt, which is commercialized as Roundup-N®. Its main metabolite is aminomethylphosphonic acid (AMPA), which is recognized by some authors as slightly toxic. There is evidence of resistance of some species of herbs that adapt after prolonged use of glyphosate.

In the present study the behavior of glyphosate and AMPA in three soil profiles of the Haplustol Entish type from the Province of Córdoba, Argentina was evaluated. An agronomic plot was selected over a period of cultivation (application 540ug / kg 2LT / Ha). Samples were collected following a systematic random approach at depths of 5 cm, 40 cm and 90 cm with manual hole digger. In each sampling location, soil samples were taken at times after application of glyphosate of 7, 30, 60, 90, 120 and 150 days. The samples collected were analyzed for organic matter, percentage of organic carbon, total nitrogen, nitrate-nitrogen, extractable phosphorus, electrical conductivity and pH. The analytical determination of glyphosate and AMPA (Primost, 2013) was also performed. To determine the persistence of glyphosate and AMPA in soil, clay characterization was completed according to the Moore and Reynolds' (1997) protocol. The correlation between the parameters analyzed and the behavior of glyphosate and AMPA in different soil profiles was assessed using Principal Components Analysis (PCA), with the statistical software InfoStat 2008. A variance analysis was also performed for the concentrations of glyphosate and AMPA, with the time of degradation and the different levels of soil profile studied.

Both glyphosate and its metabolite (AMPA) showed rapid microbiological degradation in soil (60 days). Glyphosate did not have vertical mobility associated to infiltration; however, AMPA was mobilized at 60 days after glyphosate application, this is possibly related to the rain events that took place during the period studied. It is then important to take into account the times between application of the pesticide and the occurrence of rainfall. The results of the variance analysis showed a significant difference in the behavior of glyphosate and AMPA in relation to the soil profiles analyzed.

The adsorption of glyphosate into the clays and the competitive adsorption between glyphosate and phosphorus, depend on the chemical soil conditions, such as pH. It was concluded that the fate and transport of this herbicide depend on the physicochemical characteristics of soil and water transporting it.

References:

Prata, F., Camponez, V., Ivorenti, A., Tornisielo, v. & Borges, J. Glyphosate sorption and desorption in soils with distinct phosphorus levels. **2003**. *Scientia Agricola* 60(1).
Dion, H.M., Harsh, J.B. & Hill, H. Competitive sorption between glyphosate and inorganic phosphate on clay minerals and low organic matter soils. **2001**. *J. Radioanal. Nucl. Chem.* 249, 385-390.

Acknowledgements:

SECyT - Universidad Nacional de Córdoba
Laboratorio de Arcillas - CICTERRA - Córdoba