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Persistence of glyphosate and AMPA in soils and grains of GR crops under various agricultural contexts in Québec (Canada)

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In Quebec, two thirds of industrial soybean producers use glyphosate-resistant (GR) plants combined to glyphosate-based herbicide. Consequently, the presence of glyphosate and its main degradation product, AMPA, has been detected in most streams of the agricultural region in Québec showing a potential to persist for a while in the environment after the herbicide application. In this study, we measured glyphosate and AMPA concentrations in soils cultivated in 2014 for soybean production as well as soy beans themselves in 70 sites across the plain of the St Lawrence (Québec). These sites encompassed the major agricultural practices locally employed, i.e. conventional GR, IP and organic cultures. Three soil samples at the beginning and at the end of the cultivation season and three pooled grain samples by site from each of 6 plants samples at the harvest time were collected at each site. Glyphosate and AMPA concentrations were measured with a gas chromatograph equipped with an electron capture detector (GC-ECD). A large concentration range of detectable glyphosate was measured in soils prior glyphosate-based herbicides application (0.03 to 2.9 mg.kg-1 of soil) as well as at the harvest time. AMPA was also measured in soils before the herbicide application and persisted until the harvest time (0.01 to 1.7 mg.kg-1 of soil). Glyphosate and AMPA residues were also measured at the harvest time in grains produced with glyphosate-based herbicides, indicating a translocation of the herbicide in soybean plants. Glyphosate was not detected at all sites, suggesting that the persistence of the herbicide depends on the soil type and cropping practices.

Palavras-chave: Pesticide, agricultural practices, soil type, herbicide residues, soybean crops