

Facts about Glyphosate in the terrestrial environment - by Silva Vera¹

- **Occurrence of Glyphosate and its main metabolite AMPA in soils**

Glyphosate is the most applied herbicide in Europe. The first systematic monitoring on Glyphosate residues in European soils has been recently carried out by Silva et al. and is currently under review at the scientific journal "Science of the Total Environment". The authors present European wide monitoring data from more than 300 soil samples taken in 10 countries.

Glyphosate and its first metabolite AMPA are detected in 45% of European agricultural top soils (da Silva et al.). AMPA was detected with a higher frequency and with higher concentrations than Glyphosate. AMPA was detected with concentrations up to 2 mg kg⁻¹ soil.

- **Persistence of Glyphosate and its main metabolite AMPA in soils**

The decay of Glyphosate and AMPA in soil strongly depends on temperature and soil moisture. Glyphosate dissipates fast under warm and moist conditions (DT50 (half life time) 1.5 days, DT90 (90% decay) 53 days (Bento et al. 2016), but it persists 30 times longer under cold and dry conditions (DT50: 53 days, DT90: 280 days). EFSA presented DT90 values for Glyphosate in a range from 67-387 days and for AMPA from 942 to >1000 days (EFSA 2013).

This high persistence of Glyphosate and AMPA in soils and the fact that they are strongly adsorbed to soil particles lead to a high risk of soil pollution. Knowledge on the effect on soil biota is limited. However, Glyphosate and AMPA are NOT immobilized in soils, but underlay a strong risk of off site transport by erosion:

- **Risk of transport of Glyphosate and AMPA by wind erosion and concentration in dust
- risk for human exposure**

If Glyphosate is applied to soils in regions prone to wind erosion, human exposure can be very high. In case of wind erosion Glyphosate and AMPA contents are concentrated in sediment particles <10 µm (PM10), and that their content diminishes with increasing particle size. The risk of off-site airborne transport of glyphosate and AMPA with dust is, therefore, very high. Because glyphosate and AMPA hardly decay under dry conditions of the soil, this risk is intensified if glyphosate is applied in arid and semi-arid areas or during long periods of draught. If glyphosate and AMPA contaminated PM10 fractions of soil are emitted to the atmosphere, they may be inhaled by humans and animals. Particles < 4µm are directly long relevant. (details see Bento et al. 2017).

Glyphosate and AMPA were detected in 50% of air samples from agricultural areas in the U.S.A with concentrations up to 9.1 and 0.97 ng m⁻³ (Chang et al., 2011). The contribution of wind erosion or drift to the atmospheric concentration of glyphosate and AMPA is still unknown.

The air pollution contributes to the risk of human and animal exposure and, therefore, more attention should be paid to this route of exposure.

- **Risk of transport of Glyphosate and AMPA by water erosion
- risk for transport to surface water bodies and aquatic life**

Glyphosate and AMPA are >90% adsorbed to soil particle, but this does not mean that they are immobilized in the soil. In contrary, they are transported adsorbed to the finest soil particles by water erosion to the aquatic bodies (Zuilhof et al. 2016). Actual models applied for the approval of pesticides (PELMO, PEARL) do not consider this particulate transport ways and therefore do not predict surface water pollution in the dimension we actually find. Glyphosate and AMPA have been analyzed in respectively 75350 and 57112 surface water samples across Europe, and were detected in 33% and 54% of the samples at levels up to 370 µg L⁻¹ and >200 µg L⁻¹ (Horth, 2012).

- **EU legislation does not present environmental quality standards for Glyphosate and AMPA in soil nor in surface water (EC, 2013).**

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Urgently target values are required for Glyphosate and AMPA in soils taking into consideration their potential negative effects on soil biodiversity, aquatic life and human exposure. Considering the high occurrence and persistence in soils and risks for the surrounding environment the further approval for Glyphosate on the European market cannot be recommended.

References

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