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# Turnover mass balance of bromoxynil in two German soils

**MAHSA NAMINI**[1], ANJA MILTNER[2], KAROLINA M. NOWAK[3], MARKUS TELSCHER[4], ERIKA SEIDEL[4] AND MATTHIAS KAESTNER[2]

[1]Helmholtz-Centre for Environmental Research GmbH - UFZ
[2]Helmholtz-Centre for Environmental Research GmbH - UfZ
[3]Technische Universität Berlin
[4]Bayer CropScience AG

Presenting Author: mahsa.namini@ufz.de

Bromoxynil is used worldwide for weed management to maintain high agricultural yields demanded by the constantly growing world population. However, knowledge on the fate and degradation kinetics of bromoxynil in different soils is still limited. By entering the soil system, organic contaminants can either be degraded by soil microorganisms or be immobilized/sequestered to soil organic matter (SOM) forming non-extractable residues (NER). It still remains difficult to associate the environmental risk with the formation of NER as their chemical composition is often unknown. However, both bromoxynil and its transformation products can be utilized by soil microorganisms as a carbon and energy source for microbial biomass formation. The microbial biomass is then stabilized after the death of these degraders within SOM, thus forming biogenic NER (bioNER) that do not pose any environmental risk.

We investigated the kinetics of microbial transformation of $^{13}C_6$-labelled bromoxynil over a period of 64 days according to the OECD guideline 307 in two German soils with different pH and organic carbon content. A mass balance approach with stable isotope labelling was used to trace the processes of biodegradation and NER formation. First results on biodegradation kinetics reveal similar degradation trends with mineralization of approximately 20% of initially applied $^{13}C_6$-bromoxynil in both soils. Total NER show an immediate increase after 4 days of incubation to 80% $^{13}C_6$-bromoxynil equivalents.

Microbial activity and formation of bioNER was monitored and estimated by measurements of amount and isotopic composition of extracted biomarkers like fatty acids (FA) and amino acids (AA), allowing a clear distinction of bioNER from potentially hazardous NER. Only a minor contribution of these NER could be assigned to microbial biomass with about 0.2% of $^{13}C_6$-bromoxynil equivalents in the FA fraction after 64 days of incubation. Since the AA fraction is assumed to provide 50% of microbial biomass, estimations on bioNER are more precise and details will be shown in the presentation. Our detailed analyses revealed that substantial amounts of NER were formed fast from bromoxynil in both soils differing in their soil properties. The majority of these NER still remain unidentified since only minor parts were identified as bioNER.