



MUTReWa Measures for a more sustainable management of pesticides in regional water management

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Introduction

Pesticides are widely known as compounds with adverse effects on ecosystems' health. Hence, research about the environmental behavior of pesticides has been conducted for a long time. Besides strong regulations for their approval and application and divers measures to reduce inputs, high pesticide concentrations are still detected in the environment. Furthermore, transformation products (TP) of the pesticides applied have not been taken into account in research and in the effects of certain mitigation strategies. Among others, we focussed on the following topics in our subproject:

- Investigation of transformation processes in surface water, drainage water and drinking/raw water at catchment scale
- Exposure assessment of lentic small water bodies (LSWB) which are essential for biodiversity in cultivated landscapes
- Improvement of process understanding in a retention pond to mitigate pesticide contamination of receiving water bodies

We focussed on the herbicides metazachlor and flufenacet as well as their transformation products sulfonic acid (ESA) and oxalic acid (OA).

Results

Our results reveal that TPs can be observed at catchment scale. Furthermore, they were analyzed in concentrations up to 10 x higher than the applied mother compound (MC) and especially the TPs M-ESA and M-OA were detected in background concentrations up to 0.3 $\mu\text{g L}^{-1}$ one year after application of the MC. Analysis of the hydrological conditions demonstrate the correlation of high pesticide inputs when application and severe precipitation events coincide.

In the LSWB, similar input patterns were observed for metazachlor and all TPs but not for flufenacet. Furthermore, a target screening of 106 compounds showed positives of three pesticides in all LSWB who had not been applied in that year or even longer.

Experiments in the retention pond determined a residence time of a water volume from 5 min up to 55 h. By this, mitigation efficiencies cannot be calculated for one day but for a certain period of observation. The studied retention pond showed no mitigation for metazachlor, but 2.5 g for M-OA and 6.5 g for M-ESA. Flufenacet was not in the focus of this experiment.

In drinking/raw water M-ESA was continuously detected in concentrations up to 0.7 $\mu\text{g L}^{-1}$ in two of five private wells.

Keywords: lentic small water bodies, transformation product, retention pond, flufenacet, metazachlor