OC21 - Exposure and vulnerability of ponds and small lakes to pesticides

Lorenz, S.[a], Horney, P.[b], Kronvang, B.[c], Rasmussen, J.J.[c], Stähler, M.[a], and Golla, B.[b]

[a]Institute for Ecological Chemistry, Plant Analysis and Stored Product Protection, Julius-Kühn-Institute, Berlin, Germany
[b]Institute for Strategies and Technology Assessment, Julius-Kühn-Institute, Kleinmachnow, Germany
[c]Department of Bioscience, Aarhus University, Silkeborg, Denmark

Small water bodies (SWB) are freshwater ecosystems of high ecological relevance. However, they receive considerably higher inputs of pesticides compared to larger water bodies owing to their close connection to adjacent agricultural fields in combination with their low water volume or discharge. It was recently shown that a disproportionally low amount of studies addresses pesticide occurrence and impacts in SWB with largely limited available data on pesticide effects for natural lentic SWB (ponds, kettle holes, small lakes). Successful management of pesticide risks for lentic SWB requires knowledge concerning the environmental concentrations of chemicals. Particularly the monitoring of the pesticide contamination of lentic SWB is challenging as spatial and temporal factors affect pesticide concentrations in the water bodies.

This presentation exemplifies the magnitude of three different pathways of pesticide entries (spray drift, run-off, tile drainage) into agricultural lentic SWB. We monitored the occurrence of seven pesticides after application by the local farmer (spray drift event) and heavy rain (run-off event) in three agricultural kettle holes (located in north-eastern Germany) protected by 10 m buffer zones in 2014. Additionally, we monitored the total tile drainage water outflow of one agricultural field (located in western Denmark) after two intense rain events for pesticides in 2015. All tile drainage water was redirected to a constructed pond where an automatic water sampler took samples from the pond inlet (≙ outflowing tile drainage water) over the course of the rain event (≙ period of inlet water level increase).

Furthermore, management needs information on the current status of lentic SWB protection at large, preferably national scales to guide practitioners reducing pesticide entries. We provide here an overview of the pondscape vulnerability to pesticide entries analysing the structural land usage in close proximity to lentic SWB by the example of Germany. Using GIS, we analysed lentic SWB in agricultural land with surface areas >0.01 to <0.05 km² and calculated the percentages of different structures (agricultural field, meadows, buffer zones, trees, hedges, etc.) in an area of 0–10 m to the adjacent fields.

Our results show that the creation of buffer zones is a suitable tool to reduce pesticide concentrations in agricultural SWB resulting from spray drift and run-off below ecological relevant concentrations. However, only a minor amount of SWB shows buffer zone widths which sufficiently reduce pesticide entries, and tile drainage water may constantly deliver pesticides to SWB that have been applied several years ago.