Preliminary study on the partitioning of pesticides in surface waters

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Objectives

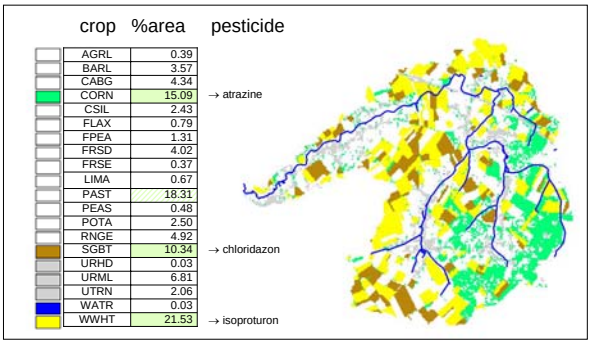
The aim of the study is twofold:

- initial study on the partitioning of pesticides between the different compartments of a water system
- the set up of a monitoring campaign during the whole pesticide application period, studying the fractions of pesticides in suspension, bound on suspended solids and sediment and present in pore water

Study area: the Nil-catchment

• location
- small basin
  area = 32 km²
  length = 14 km
- well documented
- pesticide data collected

• land use



• pesticide application (Beernaerts *et al.*, 2002)

AI	Culture	Application date: march	april	may	june	july
atrazine	corn					
isoproturon	winter wheat					
	barley					
chloridazon	beet					
lenacil	beet					
	flax					
diuron	non agriculture					
simazine	non agriculture					
	green peas					

Initial sampling

• Sampling: July 7, 2003: water and sediment samples ('Van Veen' grab) taken at the debouchement and halfway upstream

• Analysis:
water sample: determination of amount of suspended solids: gravimetrically after filtration over a glass fibre filter
sludge sample: pore water and sediment separated through filtration under pressure
content of herbicides in solution, on suspended solids, in pore water and on the sediment was measured by LC-MS

• Results: relative fraction of pesticides in each compartment calculated

assumptions: water: column thickness = 40 cm
sediment :- thickness = 20 cm
- dry bulk density = 0.53 kg/l
- porosity = 80%
suspended solids: downstream = 17 mg/l
upstream = 8mg/l

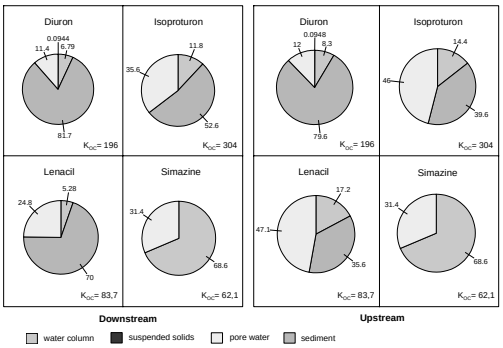


Figure 1. Presentation of the calculated partitioning of pesticides over the different compartments in a water system

• high K_{OC}-values represent high tendency to interact with OM
Thus, high tendency to react with sediment

• for all pesticides, pore water conc. > water column conc.
→ sediments can be an important source of pesticides

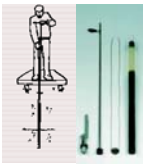
• increase of the fraction of pesticides in the sediment downstream

• 'Van Veen' grab samples result in analysing historic contamination
→ for dynamic modelling we are only interested in top-layer

2004 Monitoring campaign

- water samples at two locations (one upstream and one at the mouth): 50 ml taken every 15 min. and mixed over 8 hours: 15 MAR – 15 JUN
- analysis of pesticides in suspension and bound on suspended solids: isoproturon, atrazine, lenacil, diuron, chloridazon, glyphosate + AMPA, simazine

- sediment samples taken every week with a multisampler



- taking undisturbed samples
- freezing and slicing
- analysing pore water and sediment of top-layer

Conclusions

- a preliminary study was performed
- set up of a comprehensive monitoring campaign and additional experimental work will result in a better insight in the different reactions of pesticides with suspended solids, the sediment and the pore water

References

Beernaerts S., Debongie P, De Vleeschouwer C. and Pussemier L. 2002. Groenboek Belgaqua-Phytophar 2002, pp. 33-38.

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