TERRESTRIAL ECOTOXICITY - CAN AQUATIC ECOTOXICITY DATA GIVE A CLUE ?

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Introduction

At present, the amount and quality of existing ecotoxicity data is much more comprehensive for the aquatic than for the terrestrial compartment. This is a result of the historical development in environmental management primarily focussing on clean air and water. Soil and sediment protection as well as remediation of contaminated sites were taken into consideration much more recently. Further to this the (relative) ease in aquatic ecotoxicity testing contributed to the comparably comfortable database. The objective of this project was to investigate whether extrapolations from aquatic ecotoxicity data to effects in soil are possible. In a first step a suitable data base for the terrestrial compartment has to be created. The data elaborated so far are presented in the following.

Material & Methods

Soils:

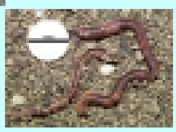
- Sandy, silty, loamy soils
- Corg [%]: 1.0, 1.7, 3.3
- pH (KCl): 6.3; 6.3; 5.5

Terrestrial tests:

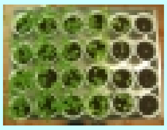
- Microorganisms
  Basal and substrate induced respiration activity: ISO 17155
  Potential ammonium oxidation activity: ISO/DIS 15685

- Collembola (*Folsomia candida*)
  Reproduction: ISO 11267

- Earthworms (*Eisenia fetida*)
  Reproduction: ISO 11268-2



- Plants (*Avena sativa, Brassica rapa*)
  Germination, growth: ISO 11269-2



Chemicals:

Covering a wide range of log K_{ow}-values

Application:

After application of the test substances: aging for 14 days at 4 °C

Results

Results are presented in the Table:

- large variety in EC_{50} ⇒ suitable basis for the following extrapolation procedures
- EC_{50} for all test systems and soils for B(a)P > 128 mg/kg and DDT > 1000 mg/kg (log K_{ow} B(a)P: 6.13; log K_{ow} 4,4-DDT: 6.91)
- differences in toxicity depend on the soil
- sensitivity of the test organisms differs up to two decimal powers
- sensitivity for one group of organisms differs depending on species and activity
- *Avena sativa* (data not shown) less sensitive than *Brassica rapa*

EC_{50}-values [mg/kg] for the investigated chemicals

Test system	Sandy soil	Silty soil	Loamy soil
Cd^{2+}			
Basal respiration	384 (284)	> 640	> 640
SIR	538	> 640	> 640
Nitrification	149	328	472
Folsomia candida	28	27	52
Eisenia fetida	19	56	157
Brassica rapa	91	103	154
Trinitrotoluol (log K_{ow}: 1.6)			
Basal respiration	125-500	> 500	> 500
SIR	20	> 500	460
Nitrification	21	31	39
Folsomia candida	42	3.7	12
Eisenia fetida	68	107	167
Brassica rapa	125-500	125-500	125-500
3,4-Dichloroaniline (log K_{ow}: 2.69)			
Basal respiration	> 810	> 810	> 810
SIR	264	375	175
Nitrification	23	34	116
Folsomia candida	10-30	10-30	30-90
Eisenia fetida	90-270	90-270	341
Brassica rapa	90-270	90-270	270-810
2,4-Dichlorophenol (log K_{ow}: 3.06)			
Basal respiration	> 640	160-640	> 640
SIR	40-640	> 640	> 640
Nitrification	2.2	3.7	17
Folsomia candida	122	28	160-640
Eisenia fetida	78	320	265
Brassica rapa	160-640	> 640	> 640
Tributyltin (log K_{ow}: 4.76)			
Basal respiration	> 1000	> 1000	> 1000
SIR	> 1000	> 1000	> 1000
Nitrification	11	64	156
Folsomia candida	22	11	66
Eisenia fetida	1.3	3.0	2.7
Brassica rapa	25	16	39
Pentachlorophenol (log K_{ow}: 5.12)			
Basal respiration	> 640	> 640	> 640
SIR	> 640	342	217
Nitrification	7	14	113
Folsomia candida	8	19	48
Eisenia fetida	13	41	60
Brassica rapa	33	28	23

Acknowledgement

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