A passive dosing method to determine fugacity capacities and partitioning properties of leaves

The capacity of leaves to take up chemicals from the atmosphere and water influences how contaminants are transferred into food webs and soil. We provide a proof of concept of a passive dosing method to measure leaf/polydimethylsiloxane partition ratios (Kleaf/PDMS) for intact leaves, using polychlorinated biphenyls (PCBs) as model chemicals. Rhododendron leaves held in contact with PCB-loaded PDMS reached between 76 and 99% of equilibrium within 4 days for PCBs 3, 4, 28, 52, 101, 118, 138 and 180. Equilibrium Kleaf/PDMS extrapolated from the uptake kinetics measured over 4 days ranged from 0.075 (PCB 180) to 0.371 (PCB 3). The Kleaf/PDMS data can readily be converted to fugacity capacities of leaves (Zleaf) and subsequently leaf/water or leaf/air partition ratios (Kleaf/water and Kleaf/air) using partitioning data from the literature. Results of our measurements are within the variability observed for plant/air partition ratios (Kplant/air) found in the literature. Log Kleaf/air from this study ranged from 5.00 (PCB 3) to 8.30 (PCB 180) compared to log Kplant/air of 3.31 (PCB 3) to 8.88 (PCB 180) found in the literature. The method we describe could provide data to characterize the variability in sorptive capacities of leaves that would improve descriptions of uptake of chemicals by leaves in multimedia fate models.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Stockholm University, Helmholtz Centre for Environmental Research
Contributors: Bolinius, D. J., Macleod, M., McLachlan, M. S., Mayer, P., Jahnke, A.
Number of pages: 6
Pages: 1325-1332
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Environmental Science Processes & Impacts
Volume: 18
Issue number: 10
ISSN (Print): 2050-7887
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.84 SJR 1.118 SNIP 0.933
Web of Science (2017): Impact factor 2.491
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.79 SJR 1.036 SNIP 0.967
Web of Science (2016): Impact factor 2.592
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.5 SJR 0.998 SNIP 0.923
Web of Science (2015): Impact factor 2.401
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.21 SJR 1.051 SNIP 1.047
Web of Science (2014): Impact factor 2.179
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.996 SNIP 0.949
Web of Science (2013): Impact factor 2.109
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.023 SNIP 0.87
Web of Science (2012): Impact factor 2.085
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1