Fate of xenobiotic compounds and plants activity in reed bed sludge treatment

Chen, Xijuan; Pauli, Udo; Rehfus, Stefan; Bester, Kai

Publication date:
2009

Document Version
Publisher's PDF, also known as Version of record

Fate of xenobiotic compounds and plants activity in reed bed sludge treatment

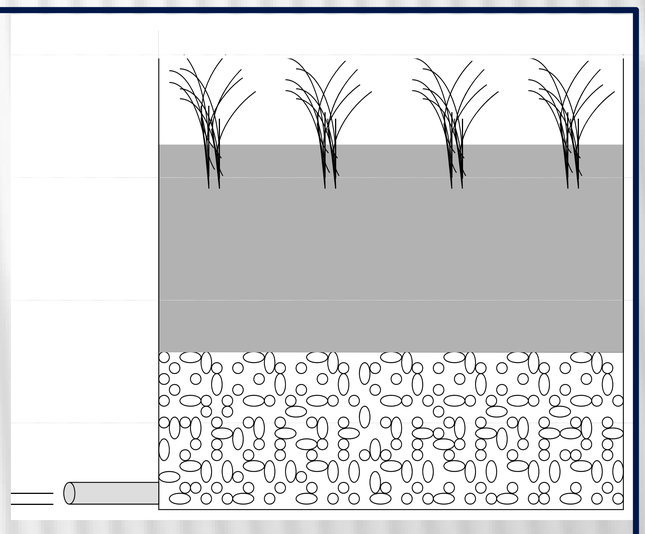
Xijuan Chen [1,3], Udo Pauly [2], Stefan Rehfus [2], Kai Bester [1,3]

1) Section of Environmental Engineering, Aalborg University, Aalborg, Denmark
2) EKO-PLANT GmbH, Neu-Eichenberg, Germany
3) Institute of Environmental Analytical Chemistry, University Duisburg-Essen, Germany
Email: xc@bio.aau.dk, kb@bio.aau.dk

INTRODUCTION

Sludge reed beds have been used for dewatering (draining and evapotranspiration) and mineralisation of sludge in Europe since 1988. Although reed beds are considered as a low cost and low contamination method in reducing volume, breaking down organic matter and increasing the density of sludge, it is not yet clear whether this enhanced biological treatment is suitable for degradation xenobiotic compounds. The first of two aims of this project is to assess the role of macrophytes in the sludge reed bed treatment technologies concerning different effects on removal of persistent organic compounds. The second aim of this project is to investigate the fate of xenobiotic compounds during the sludge reed bed treatment process.

METHODS

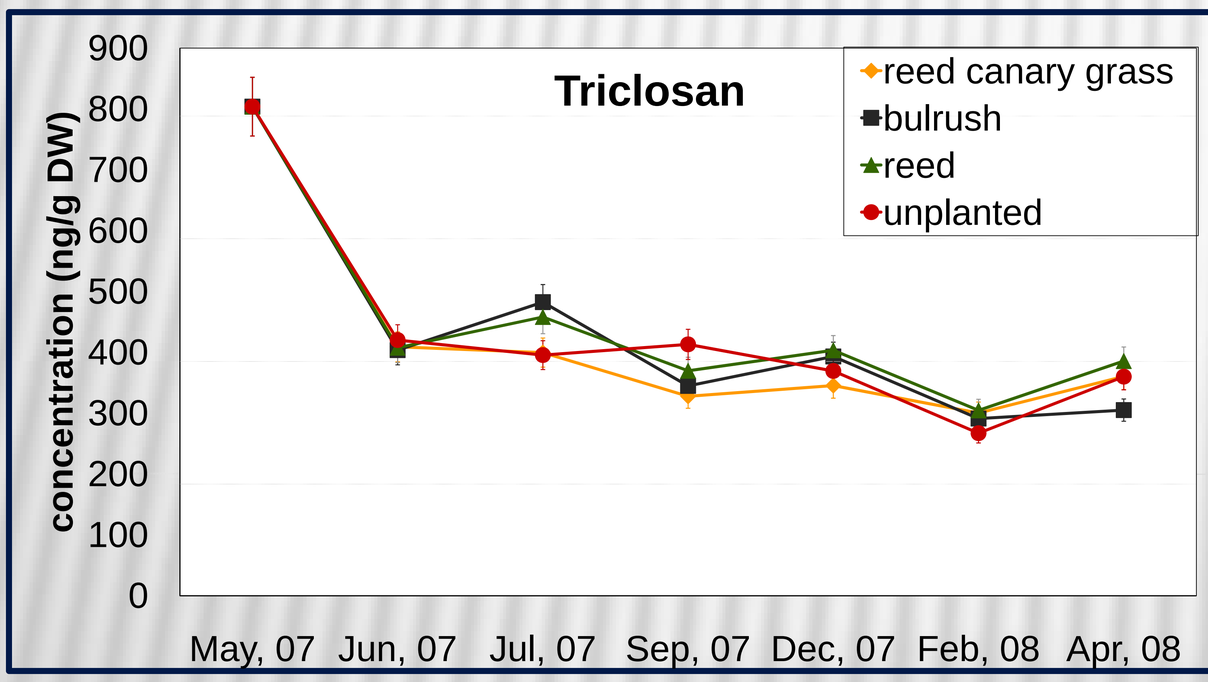


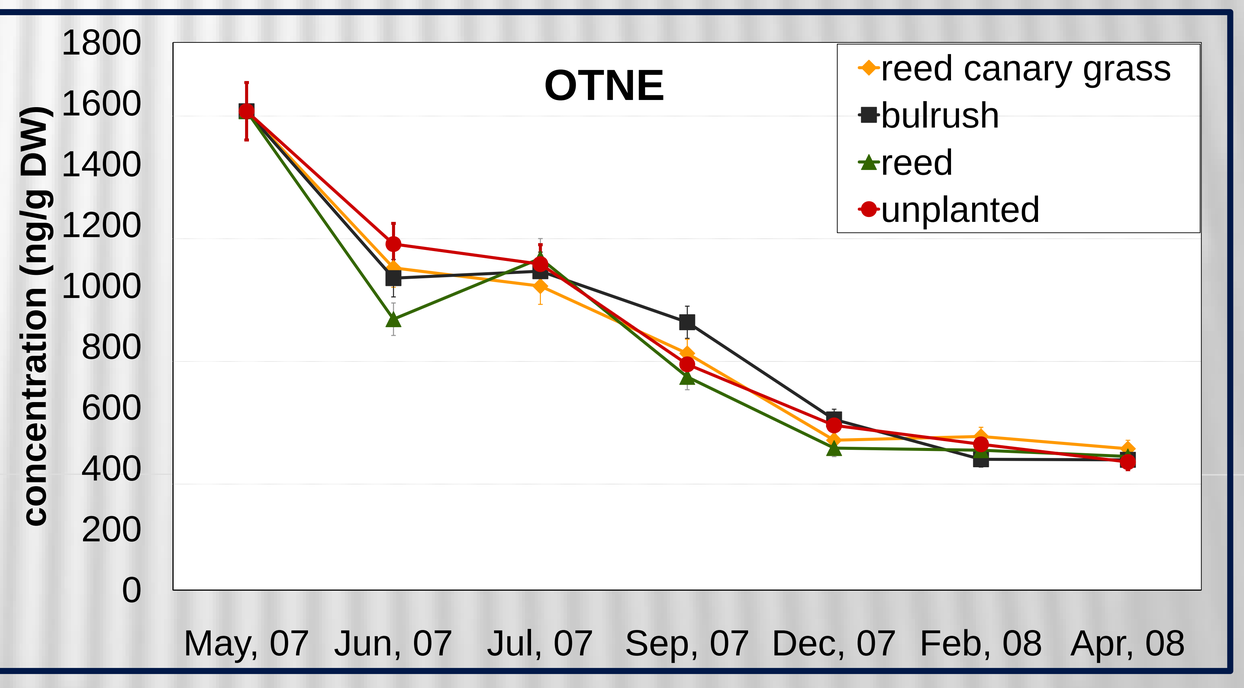
16 containers with a size of 1 m X 1 m X 1 m were built from stainless steel and filled with a 20 cm layer of gravel (16-32 mm) and 50 cm pre-treated sludge, from which plants and roots have been removed to prevent the cross-impact of reeds. The containers were placed outdoors. Four containers were planted with reed canary grass (Phalaris arundinacea), four with bulrush (Typha latifolia), another four with reed (Phragmites australis) at a density of 12 plants m^{-2} to study the plants effect on the degradation process of organic-pollutants, four containers were left unplanted in order to distinguish the impact of the root system on the performance of the containers for the degradation of the target compounds.

RESULTS AND DISCUSSIONS

During the twelve months experiment the concentration of xenobiotic compounds were decreased. There was no significant difference between samples from different containers with different macrophyte species. However, reed (phragmistis australis) grows better in sludge than the other species.

		OTNE	HHCB	AHTN	Triclosan	DEHP
Tentative half-lives (days)	reed canary grass	204	1155	866	433	408
	bulrush	187	990	770	330	315
	reed	198	1386	990	462	365
	unplanted	187	1155	770	385	533





CONCLUSIONS

The sludge reed bed container study showed that the reed bed sludge treatment technology is able to reduce persistent organic pollutant significantly. The different macrophyte species did not have a significant effect on the dewatering process as well as degradation of the respective compounds in this experiment, this is possibly due to the small size of container (1 m^3) in comparison with the large scale of reed bed.

REFERENCES

[1] Bester K. Personal Care Compounds in the Environment. VCH-Wiley, Weinheim, Germany, 2007, 9-13 pp.
[2] Chen X, Pauly U, Rehfus S, Bester K. Personal care compounds in advanced biological sludge treatment. Chemosphere 2009;accepted.