



TWIRLS

Treating Wastes for Restoring Land Sustainability

Approaches to the remediation of contaminated land

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TWIRLS

LIFE -Environment funded project

Aim: to demonstrate effective re-use of industry and municipal wastes to produce soil-forming materials for restoring degraded land.



Slate Alfred McAlpine
Blaenau Ffestiniog
Quarry, N. Wales



UPM Kymmene UK,
former Shotton
Steelworks, N.Wales



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Welsh Assembly
Government, colliery
spoil and restored
sites



NAGREF, SSIA;
TITAN Cement
Co. S.A.,
schist quarry,
Greece.



TWIRLS DEMONSTRATION SITES



Schist quarry, Kamariza, Athens
Slate quarry, Wales



Former steelworks, Wales
Former colliery, England



Shotton - former steelworks brownfield site



Problem

- Low soil organic matter
- Low water-holding capacity.
- Contaminated (VOCs & PAHs).



Action

- Add organic matter as composted wastes.
- Co-compost soil to remove contaminants.
- Seed with biodiverse grassland mix.

Co-composting experiment

Contaminated) soil, only, composted.

Contaminated soil, green waste + biosolids composted.

Contaminated soil, biosolids + paper fibre composted.

Contaminated soil, green waste+biosolids+paper fibre composted.

In-vessel composting with 80 d aeration, then 120 d maturation

Spread directly back on contaminated land.

Samples analysed prior to composting, at end of maturation and after landspreading (then after 9 mo and 16 mo).



In-Vessel Composting: EcoPOD[®] system



Mixing feedstocks



Filling pods

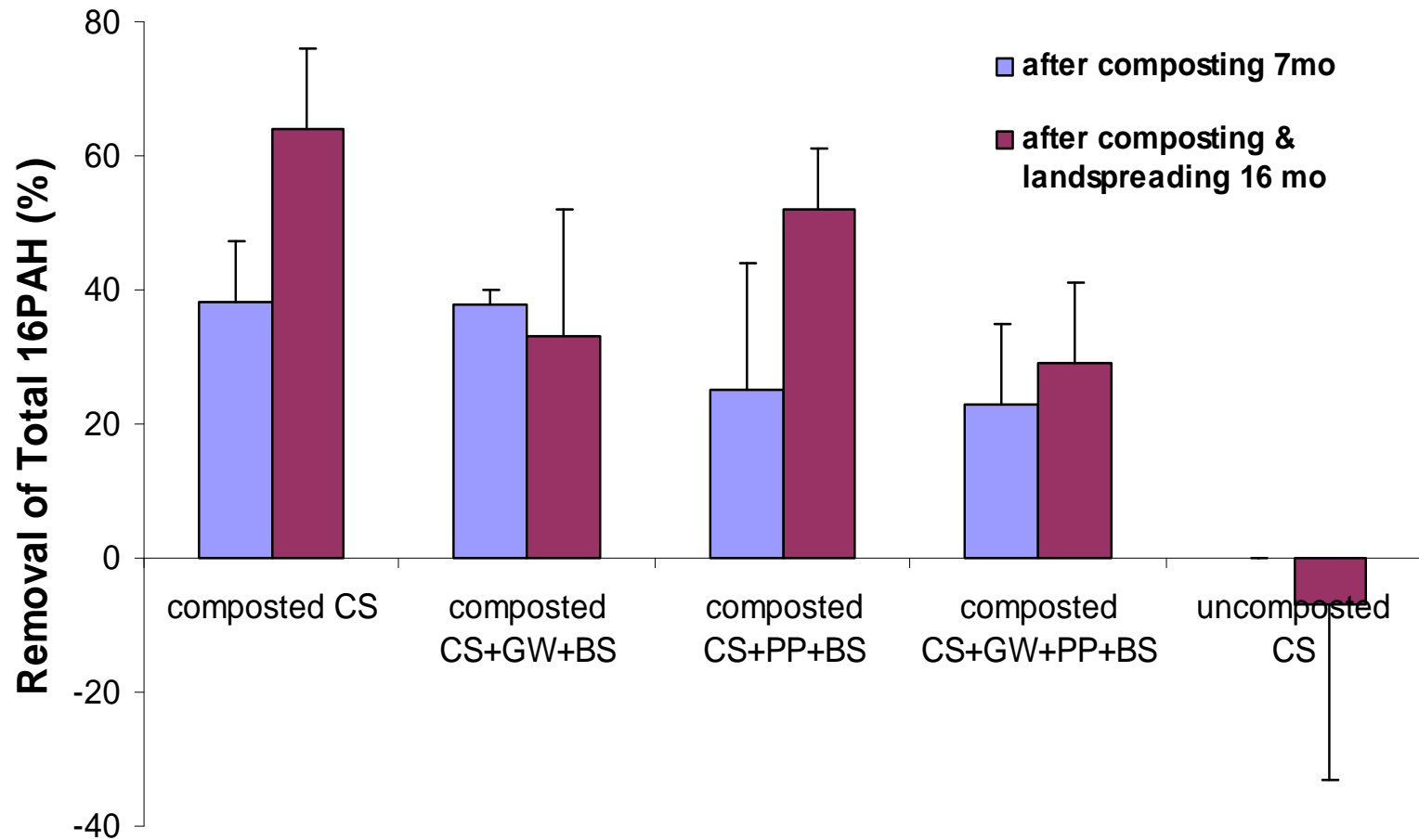


Aeration ducting

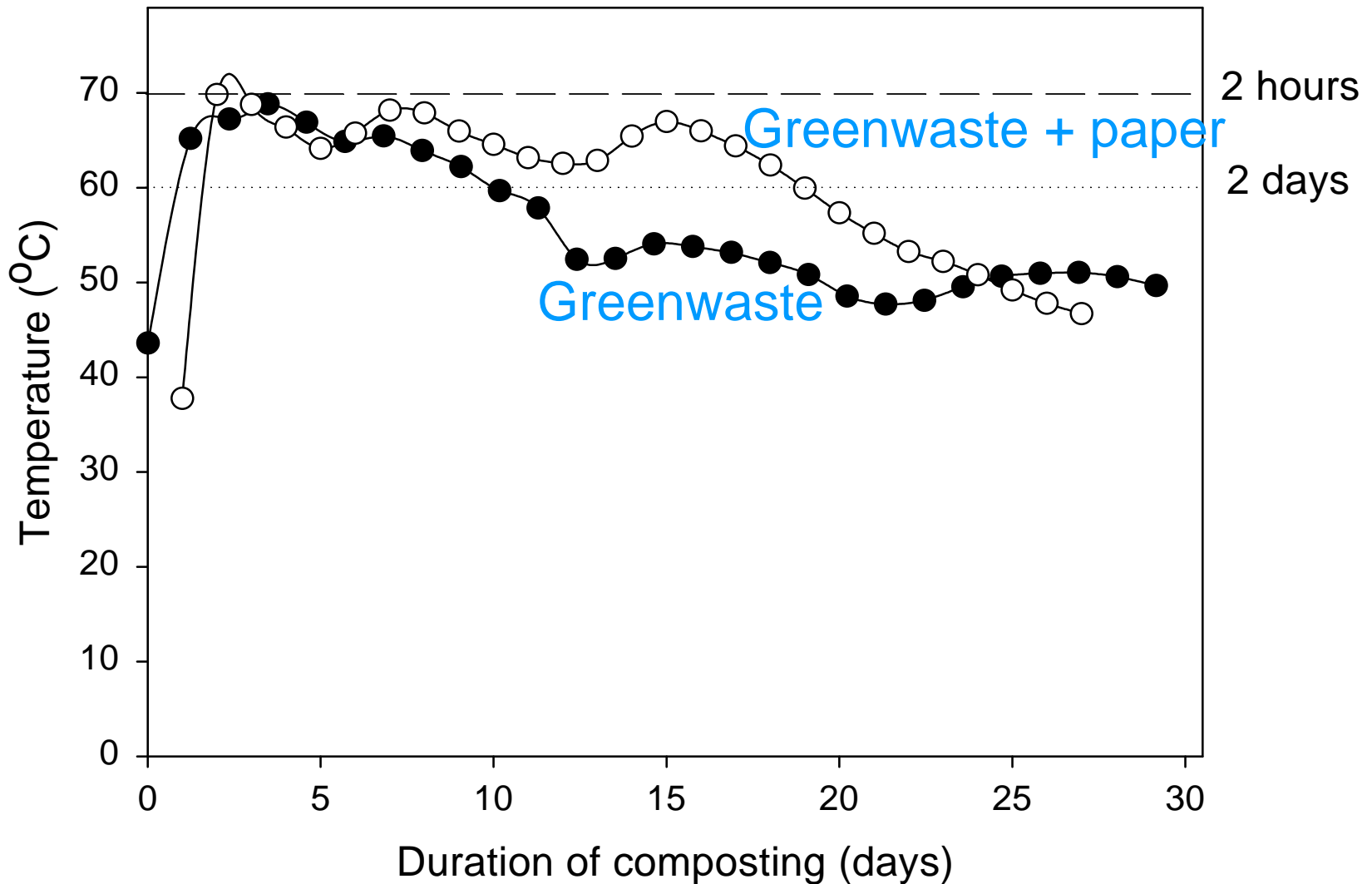


Temperature probes for process control

Percentage PAH (USEPA 16) removal after composting and landspreading contaminated soil. Values represent means \pm SEM ($n = 6$).

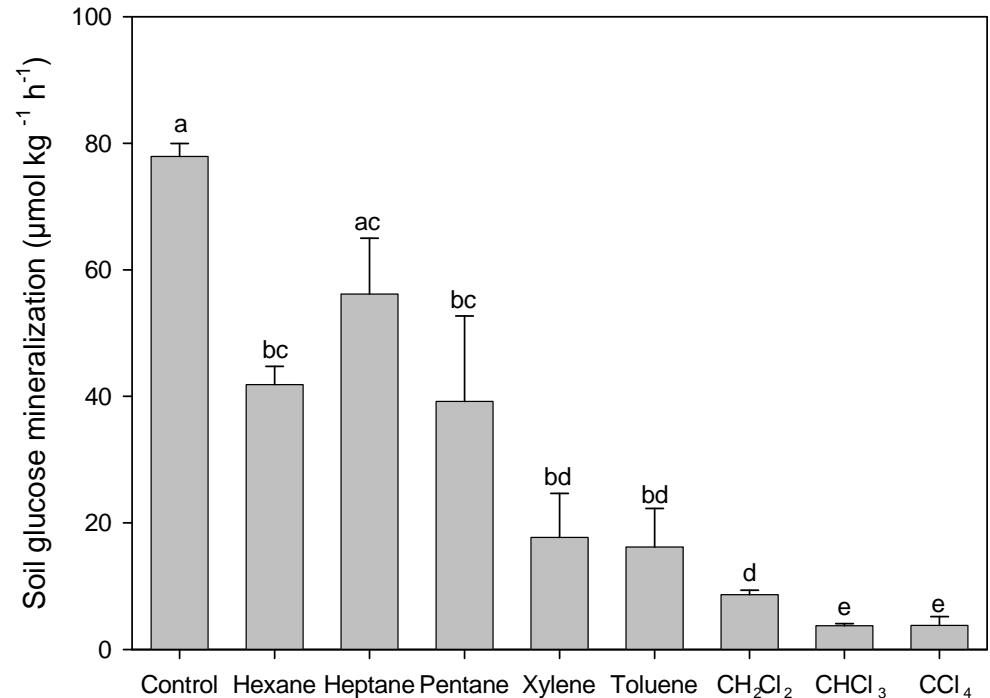
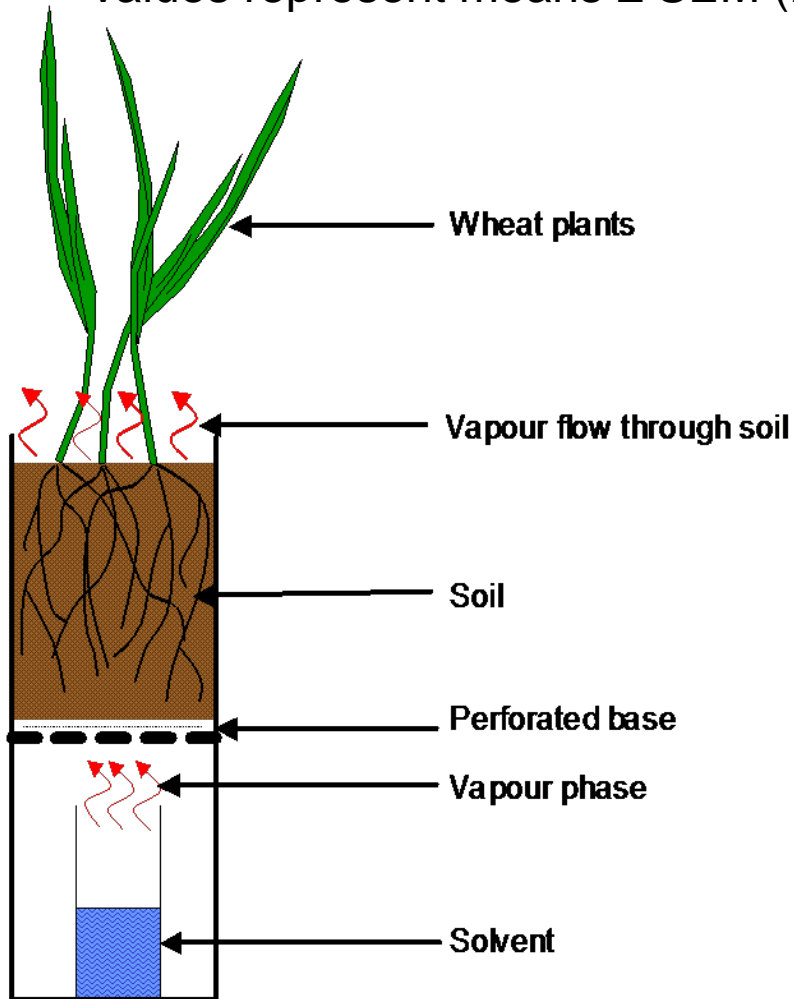


Adding paper fibre (high in labile carbon) to greenwaste results in better composting because it stimulates microbial activity.

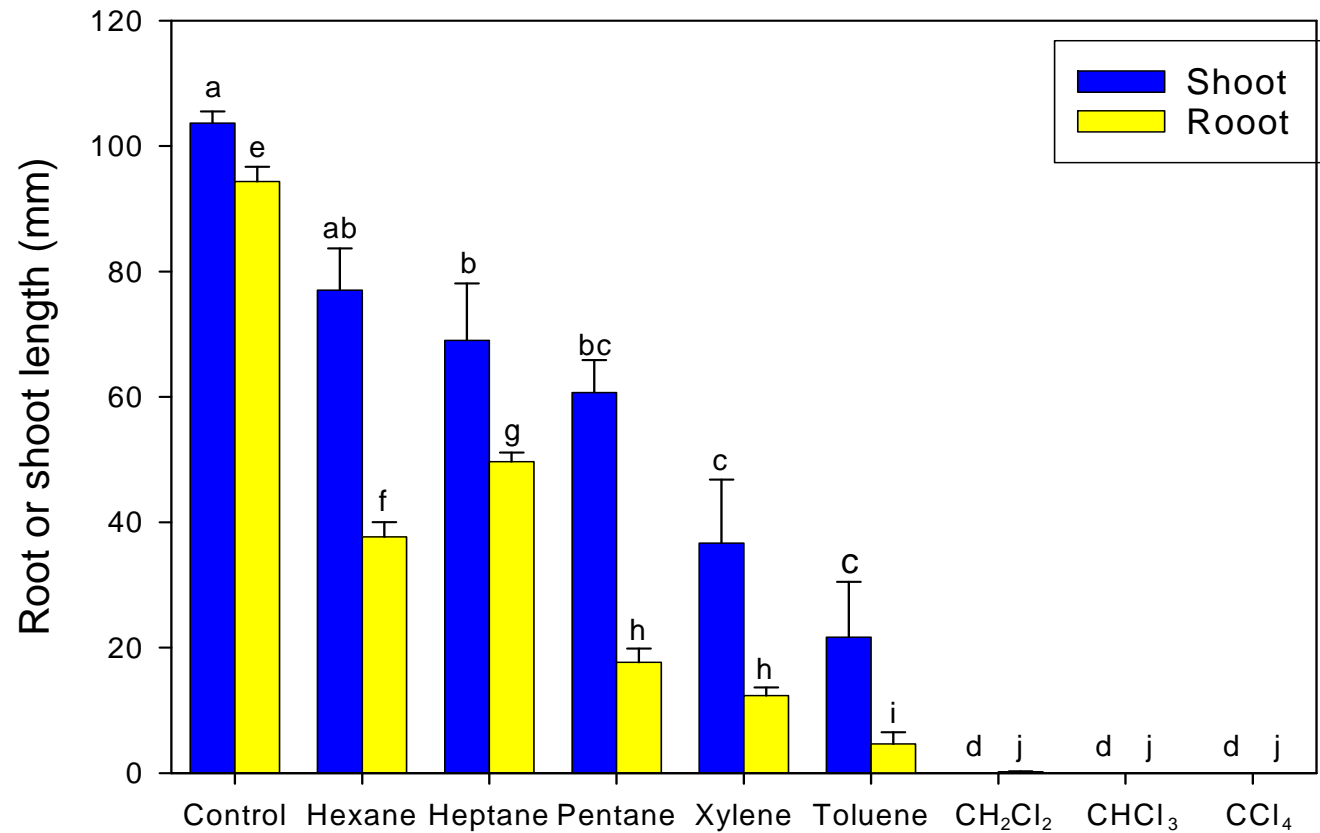


Effect of vapour phase solvent flow through soil on glucose mineralization by the soil microbial biomass.

Values represent means \pm SEM ($n = 3$). Akinola, Williamson & Jones, (in prep.)



Effect of vapour phase solvent flow through soil on plant root and shoot length. Values represent means \pm SEM ($n = 3$).



Conclusions

- ❑ Covering land polluted with volatile organic compounds may not be sufficient to block the source-receptor pathway;
- ❑ Vertical migration of vapour phase solvents through the soil profile is harmful to soil microbial and plant biomass;
- ❑ Composting and landspreading processes both resulted in dissipation of PAHs;
- ❑ Co-composting contaminated soil with organic material may initially occlude PAHs from dissipation;
- ❑ Microbial mineralization studies will evaluate whether organic material facilitates PAH biodegradation in the medium-term.