Carbon-rich sediment amendments and aging: effects on de-sorption and maize phytoextraction of 4-octylphenol and 4-nonylphenol

- SUPPLEMENTARY MATERIAL -

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1. Analytical procedure for 4-octylphenol and 4-nonylphenol

1.1 Sample preparation and extraction

Sediment samples from the incubation experiments were freeze-dried (or air-dried at room temperature, if applicable), gently disaggregated and homogenized using a mortar and pestle, and passed through a 2 mm stainless-steel sieve. Subsamples of 3.0 g dry sediment were weighed into pre-cleaned glass tubes with Teflon-lined caps.

For determination of total concentrations of 4-octylphenol (4-OP) and 4-nonylphenol (4-NP), sediment was extracted ultrasonically using an acetone/hexane mixture (1:1, v/v) following US EPA method 3550B [74]. Briefly, 3 × 10 mL of solvent were added, the suspension was sonicated, and the combined extracts were filtered through anhydrous sodium sulfate to remove residual water and then concentrated under a gentle stream of nitrogen to near dryness.

Elemental sulfur was removed by passing the concentrated extract through a short column containing copper powder according to EPA 3660B [75]. Afterwards, extracts were fractionated on a silica-gel column [76]. The column (glass, ~1 cm i.d.) was packed with activated silica gel; a top layer of ~2 g activated copper was added to further remove elemental sulfur. The extract was transferred onto the column with ~2 mL cyclohexane, allowed to enter the column bed, and then eluted following the EPA 3630C procedure [77]. The eluate was evaporated to dryness and reconstituted in 1.0 mL n-hexane for GC–MS analysis.

For desorption experiments, 4-OP and 4-NP sorbed to XAD-4 resin were analysed using the same cleanup and GC–MS conditions. After the desorption step, XAD-4 beads were separated from sediment, rinsed twice with deionized water, and subjected to ultrasonic extraction with 3 × 10 mL hexane/acetone (1:1, v/v), following the procedure described by Grgić et al. (2019b) for g-HCH and HCB [34]. The combined extracts were passed through anhydrous sodium sulfate, concentrated to near dryness and reconstituted in 1.0 mL n-hexane prior to cleanup and GC–MS determination.

1.2 Gas chromatography–mass spectrometry (GC–MS)

4-OP and 4-NP were quantified by gas chromatography with mass-selective detection (GC–MS) using an instrument equipped with an HP-5MS capillary column (30 m × 0.25 mm i.d., 0.25 µm film thickness, 5% phenyl-95% dimethylpolysiloxane). Chromatographic conditions followed those previously optimized for organohalogen compounds and alkylphenols in the same sediment matrix.

Analyses were performed in splitless injection mode with an injector temperature of 250 °C. Helium was used as the carrier gas at a constant flow of approximately 1.40 mL min^{-1}. The oven temperature programme was:

- initial temperature 70 °C, held for 2 min
- ramped at 25 °C min^{-1} to 150 °C
- ramped at 3 °C min^{-1} to 200 °C
- ramped at 8 °C min^{-1} to 280 °C, held for 10 min.

The MS was operated in electron-impact (EI) mode. Quantification was performed in selected-ion monitoring (SIM) mode. For both 4-OP and 4-NP, the target ion m/z 107 was used for quantification, with at least two additional qualifier ions monitored to confirm analyte identity. Method detection limits (MDL) and practical quantitation limits (PQL) were established for each analyte and are reported in Table S1.

1.3 Calibration and quantification

External calibration curves were constructed for 4-OP and 4-NP using at least five concentration levels prepared from stock solutions of analytical standards in n-hexane. Calibration solutions covered the concentration range expected in the processed samples.

Each calibration level was injected at least in duplicate. Linearity was assessed by least-squares regression of peak area (target ion) versus concentration. Calibration curves were considered acceptable when the correlation coefficient (R^2) was ≥ 0.995 and the residuals showed no systematic trends. Analyte concentrations in sediment and XAD-4 extracts were calculated from calibration curves using the target ion peak areas, and then converted to µg kg^{-1} dry sediment by accounting for sample mass, extraction volumes, and concentration steps.

1.4 Quality assurance and quality control (QA/QC)

Several QA/QC measures were implemented to ensure the reliability of the analytical results. All glassware was baked at ≥400 °C and rinsed with organic solvents prior to use. Procedural blanks (full extraction and clean-up without sediment or resin) were processed with each batch of samples. Target analytes were not detected in blanks, or were present below the method detection limit (MDL), so no blank corrections were required.

Method performance for 4-OP and 4-NP in sediment was evaluated using three spiked sediment samples per analyte (n = 3). Mean recoveries were 91% for 4-OP and 94% for 4-NP, with relative standard deviations (RSD) of 9% and 8%, respectively (Table S1). These values fall within the range typically considered acceptable for trace-organic analysis in complex environmental matrices. Additional spiked XAD-4 resin batches gave comparable recoveries (approximately 93–96%, RSD ≤10%), indicating that the extraction and clean-up procedures were equally efficient for desorption samples.

Analytical precision for routine samples was assessed from replicate sediment and resin extracts included in each analytical batch. The RSD of replicate analyses was generally ≤10% and did not exceed 12%, confirming good repeatability of the overall procedure. Instrument performance was monitored throughout each analytical sequence by injecting mid-level calibration standards at regular intervals; retention times and response factors were required to remain within predefined control limits (±20% for response factor, ±0.1 min for retention time). When these criteria were not met, the instrument was re-tuned and the calibration repeated.

Method detection limits (MDL) and practical quantitation limits (PQL) were established from low-level spiked sediment samples processed through the entire procedure. For both 4-OP and 4-NP, MDL and PQL were 10 µg kg^{-1} and 25 µg kg^{-1} dry sediment, respectively (Table S1). Concentrations below the PQL are reported as <PQL and were not used for quantitative evaluation of desorption behaviour.

Table S1. Method performance parameters for 4-octylphenol (4-OP) and 4-nonylphenol (4-NP) in sediment (dry-weight basis, n = 3 spiked samples).

Analyte	Target ion (m/z)	MDL (µg kg^{-1} dw)	PQL (µg kg^{-1} dw)	Mean recovery (%)	RSD of recovery (%)
4-Octylphenol	107	10	25	91	9
4-Nonylphenol	107	10	25	94	8

Note: MDL – method detection limit; PQL – practical quantitation limit; RSD – relative standard deviation; n = 3 spiked sediment samples per analyte.

2. Sediment and amendment characterization

Surface sediment was collected from the Jegrička River near the settlement of Sirig (Autonomous Province of Vojvodina, northern Serbia). Sampling was conducted in spring 2018 at three depositional locations along the same river reach:

- 45°27′27.87″ N, 19°45′09.02″ E
- 45°27′26.06″ N, 19°46′34.40″ E
- 45°27′24.47″ N, 19°48′03.27″ E

At each location, a semi-disturbed sediment core was taken using an Eijkelkamp Beeker sediment core sampler, and the upper 0–25 cm was retained. Equal portions from the three cores were combined to form a bulk composite sample. The composite sediment was homogenised, air-dried

at room temperature in the dark, gently disaggregated and sieved to <2 mm before use in spiking, desorption and pot experiments. Immediately after field collection, sediment was transferred directly from the core sampler into pre-cleaned glass jars, transported to the laboratory and stored in the dark until drying and sieving.

Basic physico-chemical, structural and surface properties of the Jegrička River sediment and the carbon-rich amendments (AC, BC, HC) were determined in previous studies on the same materials [34,35] and are compiled in Table S2 for reference; no new measurements of these properties were carried out in the present work.

The Jegrička River sediment is fine-textured and organic-rich, with 83% of particles finer than 0.063 mm and 31.6% clay. Together with a loss on ignition of 16.0% and TOC of 2.9%, this indicates a substantial content of organic matter and reactive mineral surfaces. Such sediments typically exhibit a high sorption capacity for hydrophobic organic contaminants, which is consistent with the relatively low BET surface area (20.3 m^2 g^{-1}) but measurable mesoporosity (BJH pore volume 0.077 cm^3 g^{-1}) and moderate mean pore radius (~11 nm). Microporosity is practically negligible, suggesting that sorption of 4-OP and 4-NP in the unamended sediment is dominated by partitioning into natural organic matter and interactions with mesopores and mineral surfaces rather than true micropore filling.

In contrast, the three carbon-rich amendments span a wide range of structural and surface properties. Activated carbon (AC) is highly microporous, with a BET surface area of 690 m^2 g^{-1}, micropore volume of ~0.2 cm^3 g^{-1} and total pore volume of 0.52 cm^3 g^{-1} for pores <162 nm. Its very high TOC (83.3%) and loss on ignition (88.7%), together with a carbon-rich SEM–EDS signature (83.4 wt.% C, 10.6 wt.% O), are characteristic of a strongly activated material. These features imply that AC will dominate the sorption of 4-OP and 4-NP when present, efficiently reducing the desorbable fraction even at low amendment doses.

Table S2. Physico-chemical, structural and surface properties of Jegrička River sediment and carbon-rich amendments (activated carbon, AC; biochar, BC; humic compost, HC). Sediment values are reported as mean ± standard deviation (n = 3). Amendment data are single measurements.

Parameter	Unit	Sediment	AC	BC	HC
General properties					
Loss on ignition	%	16.0 ± 0.23	88.7	92.5	45.2
Total organic carbon (TOC)	%	2.9 ± 0.10	83.3	75.4	18.5
pH	–	7.26 ± 0.07	n.d.	n.d.	n.d.
Electrical conductivity	µS cm^{-1}	1050 ± 31.8	n.d.	n.d.	n.d.
Particle size distribution (sediment)					
Sand (> 0.063 mm)	%	17.0 ± 0.01	–	–	–

Parameter	Unit	Sediment	AC	BC	HC
Coarse silt (0.020–0.063 mm)	%	23.9 ± 0.89	–	–	–
Medium silt (0.006–0.020 mm)	%	15.6 ± 0.31	–	–	–
Fine silt (0.002–0.006 mm)	%	11.9 ± 0.21	–	–	–
Clay (< 0.002 mm)	%	31.6 ± 0.21	–	–	–
Surface area and porosity					
BET surface area	$m^2\ g^{-1}$	20.3	690	0.897	2.06
BJH pore volume	$cm^3\ g^{-1}$	0.077	0.250	0.0007	0.014
Micropore volume (t-test)	$cm^3\ g^{-1}$	0.000	0.180	n.d.	n.d.
Micropore volume (HK method)	$cm^3\ g^{-1}$	0.013	0.200	0.0003	0.0007
Total pore volume	$cm^3\ g^{-1}$	0.010	0.520	0.00669	0.010
Mean pore radius	nm	11.4	0.152	14.9	1.39
Pore volume range	–	–	< 162 nm	< 204 nm	< 162 nm
SEM–EDS (normalized elemental composition)					
C	wt.% (norm.)	n.d.	83.4	81.0	43.3
O	wt.% (norm.)	n.d.	10.6	18.4	44.0
Si	wt.% (norm.)	n.d.	1.63	–	3.99
Ca	wt.% (norm.)	n.d.	1.61	0.63	4.52
Al	wt.% (norm.)	n.d.	1.38	–	1.68
Mg	wt.% (norm.)	n.d.	0.65	–	–
S	wt.% (norm.)	n.d.	0.69	–	–
Fe	wt.% (norm.)	n.d.	–	–	1.26
K	wt.% (norm.)	n.d.	–	–	1.22

Biochar (BC) has a much lower specific surface area (0.897 $m^2\ g^{-1}$) and very small total pore volume (0.00669 $cm^3\ g^{-1}$), but a considerably larger mean pore radius (~14.9 nm), indicating a structure dominated by meso- to macropores. Despite this, BC retains a high organic carbon content (75.4%) and high loss on ignition (92.5%), with a predominantly C–O composition (81.0 wt.% C, 18.4 wt.% O). This suggests that BC will act as a lower-cost, lower-surface-area sorbent, contributing to sorption and potential microbial colonization, but with a weaker capacity for strong, irreversible binding of 4-OP and 4-NP compared to AC.

Humic compost (HC) represents a more oxidized and mineral-rich amendment, with TOC of 18.5% and loss on ignition of 45.2%. Its BET surface area (2.06 $m^2\ g^{-1}$) and total pore volume (0.010 $cm^3\ g^{-1}$) are low, indicating limited additional sorptive surface compared to the sediment itself. The SEM–EDS composition (43.3 wt.% C, 44.0 wt.% O, and appreciable Si, Ca, Fe and K)

reflects a mixture of organic matter and mineral phases. Therefore, HC is expected to influence mainly nutrient status, redox conditions and microbial activity, while only modestly increasing the sorption capacity for 4-OP and 4-NP relative to unamended sediment.

Overall, the combination of a fine-grained, organic-rich sediment with amendments that differ by more than two orders of magnitude in surface area and pore volume provides a broad spectrum of sorption environments. This underpins the observed differences in desorption kinetics and residual desorbable fractions of 4-OP and 4-NP in the main text, with AC providing the strongest immobilization, BC offering intermediate performance, and HC primarily modifying biogeochemical rather than purely sorptive properties.

3. Numerical data for desorption kinetics (including plateau support), kinetic model parameters, and pot-experiment mass balances (Figures 1–3; Figures S1–S5)

To justify the operational selection of 144 h for the cumulative XAD-extractable (desorbable) fraction ($F_{des,144}$), we provide time-resolved cumulative desorption curves for 4-OP and 4-NP. Figures S1–S2 show the unamended sediment kinetics (mean ± SD, n = 3), while Figures S3–S4 present representative amended-sediment curves spanning the slowest, median, and fastest approach to the 144-h pool based on ($F_{96}/F_{144}\times100$). Figure S5 summarises the plateau metric ($F_{96}/F_{144}\times100$) across all amended conditions, demonstrating that desorption is already in the late-time tail by 96–144 h and supporting 144 h as a conservative operational endpoint.

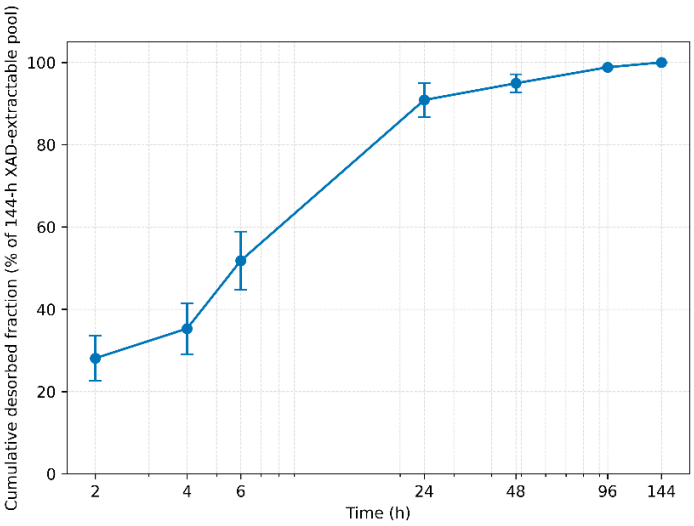

Figure S1. Unamended sediment: cumulative desorption of 4-OP during sequential XAD-4 sink extraction (2–144 h). Cumulative desorbed fraction is expressed as a percentage of the 144-h XAD-extractable pool ($F_t/F_{144}\times100$). Points show mean ± SD of replicate vials (n = 3). Time points: 2, 4, 6, 24, 48, 96 and 144 h (x-axis shown on a log scale to emphasize early-time kinetics).

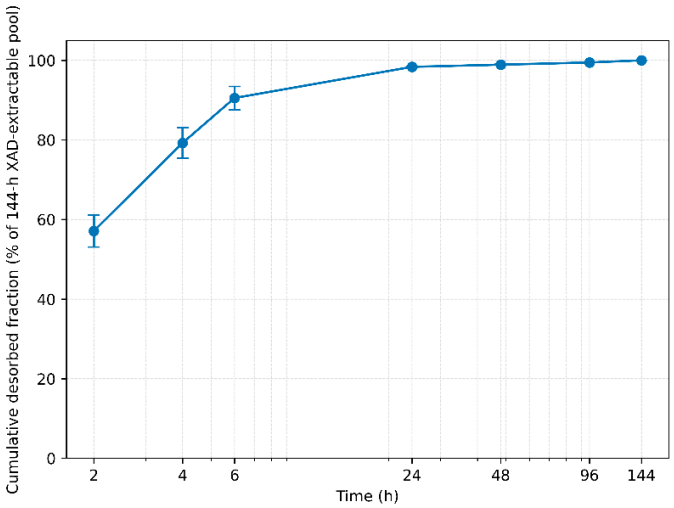

Figure S2. Unamended sediment: cumulative desorption of 4-NP during sequential XAD-4 sink extraction (2–144 h). Cumulative desorbed fraction is expressed as a percentage of the 144-h XAD-extractable pool ($F_t/F_{144}\times100$). Points show mean ± SD of replicate vials (n = 3). Time points: 2, 4, 6, 24, 48, 96 and 144 h (x-axis shown on a log scale to emphasize early-time kinetics).

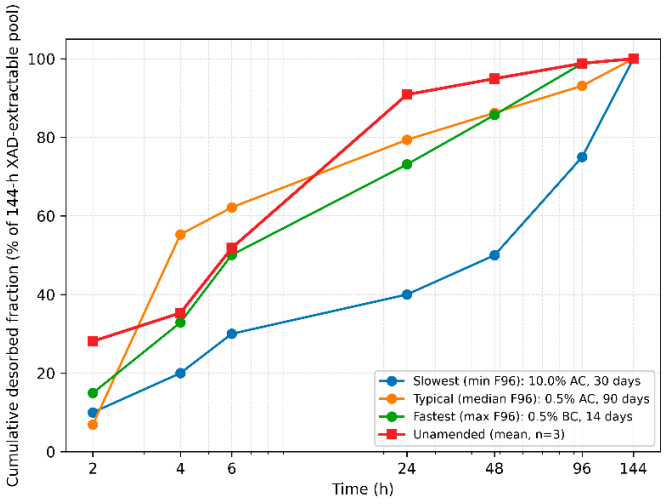

Figure S3. Amended sediments: representative cumulative desorption curves for 4-OP (plateau check). Three amended conditions are shown to span the slowest, median ("typical"), and fastest approach to the 144-h pool, based on the fraction reached by 96 h ($F_{96}/F_{144}\times100$) across all amended-treatment × ageing combinations (mean series). The unamended mean curve (n = 3) is overlaid for comparison. Cumulative desorbed fraction is expressed as ($F_t/F_{144}\times100$) at 2–144 h (log-scaled x-axis).

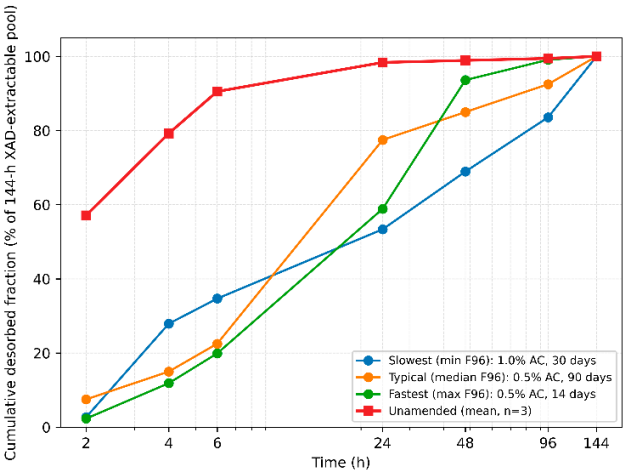

Figure S4. Amended sediments: representative cumulative desorption curves for 4-NP (plateau check). Three amended conditions are shown to span the slowest, median ("typical"), and fastest approach to the 144-h pool, based on the fraction reached by 96 h ($F_{96}/F_{144}\times100$) across all amended-treatment × ageing combinations (mean series). The unamended mean curve (n = 3) is overlaid for comparison. Cumulative desorbed fraction is expressed as ($F_t/F_{144}\times100$) at 2–144 h (log-scaled x-axis).

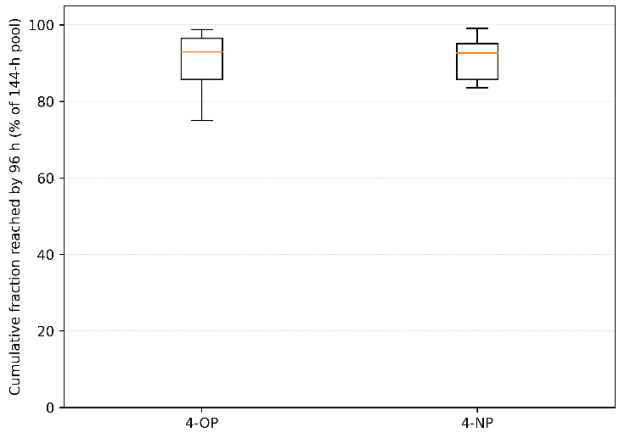

Figure S5. Plateau metric across all amended conditions: fraction of the 144-h pool reached by 96 h. Distribution of ($F_{96}/F_{144}\times100$) for 4-OP and 4-NP across all amended-treatment × ageing combinations (mean series; n = 48 per compound). Boxplots show median and interquartile range (IQR); whiskers indicate the spread of the data (as displayed).

Tables S3–S4 report the numerical values used to construct Figure 2, i.e., the cumulative amount of 4-OP and 4-NP extracted by XAD-4 after 144 h of sequential desorption (Sum XAD-4-extracted) and the corresponding fraction of the initial sediment inventory ($F_{des,144}$). Data are given for the unamended sediment and for all combinations of amendment type (AC, BC, HC), dose (0.5–10% w/w) and ageing time (14, 30, 90 and 180 days). Values <LOQ were treated as zero in the cumulative sums and in $F_{des,144}$ calculations. Table S7 summarises the best-fit parameters of the two-compartment first-order model for desorption of 4-OP and 4-NP in unamended sediment, including standard errors, 95% confidence intervals and goodness-of-fit statistics (R^2, RMSE).

Tables S5–S6 provide the mass-balance calculations underlying Figure 3. For each treatment in the pot experiment with maize, these tables list the mass of 4-OP and 4-NP in shoots (expressed per kg dry sediment), the residual sediment concentrations after 10 days of growth, and the remaining "loss" term, operationally defined as the difference between the initial sediment inventory and the sum of shoot and residual sediment masses. Percentages were calculated relative to the initial sediment mass in the freshly spiked sediment (~1.1 mg kg^{-1} for 4-OP and ~1.23 mg kg^{-1} for 4-NP; see Section 2.3). Values <LOQ were treated as zero.

Table S3. 4-OP: XAD-4-extracted mass and fraction after 144 h. Sum XAD-4–extracted is the cumulative amount desorbed over 2–144 h; $F_{des,144}$ is expressed as % of the initial mass in freshly spiked sediment.

Amendment	Dose (% w/w)	Aging (days)	Sum XAD-4-extracted (µg kg^{-1})	$F_{des,144}$ (%)
None	0.0	0	1068.6	96.4
AC	0.5	14	520.0	46.9
AC	0.5	30	457.0	41.2
AC	0.5	90	35.2	3.2
AC	0.5	180	0.0	0.0
AC	1.0	14	258.0	23.3
AC	1.0	30	363.0	32.7
AC	1.0	90	49.1	4.4
AC	1.0	180	0.0	0.0
AC	5.0	14	118.0	10.6
AC	5.0	30	101.0	9.1
AC	5.0	90	0.0	0.0
AC	5.0	180	0.0	0.0
AC	10.0	14	0.0	0.0
AC	10.0	30	0.0	0.0
AC	10.0	90	0.0	0.0
AC	10.0	180	0.0	0.0
BC	0.5	14	1012.0	91.3
BC	0.5	30	1054.0	95.1
BC	0.5	90	320.0	28.9
BC	0.5	180	0.0	0.0
BC	1.0	14	1102.0	99.4
BC	1.0	30	1028.0	92.7

Amendment	Dose (% w/w)	Aging (days)	Sum XAD-4-extracted (µg kg^{-1})	$F_{des,144}$ (%)
BC	1.0	90	368.0	33.2
BC	1.0	180	0.0	0.0
BC	5.0	14	992.0	89.5
BC	5.0	30	920.0	83.0
BC	5.0	90	194.0	17.5
BC	5.0	180	0.0	0.0
BC	10.0	14	1064.0	96.0
BC	10.0	30	1036.0	93.4
BC	10.0	90	256.0	23.1
BC	10.0	180	0.0	0.0
HC	0.5	14	1008.0	90.9
HC	0.5	30	799.0	72.1
HC	0.5	90	214.0	19.3
HC	0.5	180	0.0	0.0
HC	1.0	14	1075.0	97.0
HC	1.0	30	840.0	75.8
HC	1.0	90	131.0	11.8
HC	1.0	180	0.0	0.0
HC	5.0	14	900.0	81.2
HC	5.0	30	918.0	82.8
HC	5.0	90	159.0	14.3
HC	5.0	180	0.0	0.0
HC	10.0	14	870.0	78.5
HC	10.0	30	832.0	75.0
HC	10.0	90	339.0	30.6
HC	10.0	180	0.0	0.0

Table S4. 4-NP: XAD-4-extracted mass and fraction after 144 h. Sum XAD-4–extracted is the cumulative amount desorbed over 2–144 h; $F_{des,144}$ is expressed as % of the initial mass in freshly spiked sediment.

Amendment	Dose (% w/w)	Aging (days)	Sum XAD-4-extracted (µg kg^{-1})	$F_{des,144}$ (%)
None	0.0	0	905.8	73.6

Amendment	Dose (% w/w)	Aging (days)	Sum XAD-4-extracted (µg kg^{-1})	$F_{des,144}$ (%)
AC	0.5	14	521.0	42.3
AC	0.5	30	484.0	39.3
AC	0.5	90	36.6	3.0
AC	0.5	180	0.0	0.0
AC	1.0	14	261.0	21.2
AC	1.0	30	168.0	13.6
AC	1.0	90	61.6	5.0
AC	1.0	180	0.0	0.0
AC	5.0	14	0.0	0.0
AC	5.0	30	97.6	7.9
AC	5.0	90	0.0	0.0
AC	5.0	180	0.0	0.0
AC	10.0	14	0.0	0.0
AC	10.0	30	0.0	0.0
AC	10.0	90	0.0	0.0
AC	10.0	180	0.0	0.0
BC	0.5	14	958.0	77.8
BC	0.5	30	1079.0	87.7
BC	0.5	90	245.0	19.9
BC	0.5	180	0.0	0.0
BC	1.0	14	1137.0	92.4
BC	1.0	30	1099.0	89.3
BC	1.0	90	399.0	32.4
BC	1.0	180	0.0	0.0
BC	5.0	14	1167.0	94.8
BC	5.0	30	1120.0	91.0
BC	5.0	90	115.0	9.3
BC	5.0	180	0.0	0.0
BC	10.0	14	1217.0	98.9
BC	10.0	30	1163.0	94.5
BC	10.0	90	125.0	10.2
BC	10.0	180	0.0	0.0
HC	0.5	14	1175.0	95.5

Amendment	Dose (% w/w)	Aging (days)	Sum XAD-4-extracted (µg kg^{-1})	$F_{des,144}$ (%)
HC	0.5	30	1139.0	92.5
HC	0.5	90	186.0	15.1
HC	0.5	180	0.0	0.0
HC	1.0	14	1161.0	94.3
HC	1.0	30	1176.0	95.6
HC	1.0	90	80.4	6.5
HC	1.0	180	0.0	0.0
HC	5.0	14	1138.0	92.5
HC	5.0	30	1123.0	91.2
HC	5.0	90	34.7	2.8
HC	5.0	180	0.0	0.0
HC	10.0	14	1117.0	90.8
HC	10.0	30	1055.0	85.7
HC	10.0	90	374.0	30.4
HC	10.0	180	0.0	0.0

Table S5. 4-OP mass balance in pot experiment. Masses are expressed per kg dry sediment. "Loss" represents the difference between initial inventory and the sum of shoot + residual sediment, and comprises transformation and unquantified sinks (roots, volatilisation, sorption to pot walls, etc.).

Treatment	Shoot (µg kg^{-1} sed.)	Sediment (µg kg^{-1} sed.)	Loss (µg kg^{-1} sed.)	Shoot (%)	Sediment (%)	Loss (%)
SP	21.3 ± 4.0	0.0	1087.4	1.9	0.0	98.1
HC 0.5 %	16.6 ± 3.3	0.0	1092.1	1.5	0.0	98.5
HC 1%	10.0 ± 1.9	75.7	1023.0	0.9	6.8	92.3
HC5 %	15.4 ± 4.0	0.0	1093.3	1.4	0.0	98.6
HC 10%	10.0 ± 1.9	0.0	1098.7	0.9	0.0	99.1
AC 0.5%	23.7 ± 4.8	245.0	840.0	2.1	22.1	75.8
AC 1%	45.1 ± 9.7	5.3	1058.3	4.1	0.5	95.5
AC 5%	14.8 ± 2.5	315.0	778.9	1.3	28.4	70.3
AC 10%	22.5 ± 5.2	241.0	845.2	2.0	21.7	76.2

Table S6. 4-NP mass balance in pot experiment. Masses are expressed per kg dry sediment. "Loss" represents the difference between initial inventory and the sum of shoot + residual sediment, and comprises transformation and unquantified sinks (roots, volatilisation, sorption to pot walls, etc.).

Treatment	Shoot (µg kg^{-1} sed.)	Sediment (µg kg^{-1} sed.)	Loss (µg kg^{-1} sed.)	Shoot (%)	Sediment (%)	Loss (%)
SP	65.2 ± 15.5	0.0	1165.6	5.3	0.0	94.7
HC 0.5 %	50.2 ± 10.8	0.0	1180.6	4.1	0.0	95.9
HC 1%	36.7 ± 7.0	111.0	1083.1	3.0	9.0	88.0
HC 5 %	35.8 ± 5.9	0.0	1195.0	2.9	0.0	97.1
HC 10%	13.8 ± 2.9	0.0	1217.0	1.1	0.0	98.9
AC 0.5%	47.9 ± 15.2	347.0	835.9	3.9	28.2	67.9
AC 1%	70.5 ± 13.7	5.0	1155.2	5.7	0.4	93.9
AC 5%	21.0 ± 3.3	381.0	828.8	1.7	31.0	67.3
AC 10%	31.1 ± 11.2	238.0	961.7	2.5	19.3	78.1

Table S7. Best-fit parameters of the two-compartment first-order model describing desorption of 4-octylphenol (4-OP) and 4-nonylphenol (4-NP) from unamended Jegrička sediment. F_{fast} and F_{slow} are the fast- and slow-desorbing fractions of the total sediment-bound mass; $F_{non,mod} = 1 - F_{fast} - F_{slow}$ is the model-based non-desorbable fraction. k_{fast} and k_{slow} are first-order rate constants. Values are parameter estimates ± standard error (SE), with 95% confidence intervals (95% CI) obtained from the covariance matrix of the non-linear least-squares fit. R^2 is the coefficient of determination and RMSE is the root-mean-square error of the residuals.

Parameter	Unit	4-OP (estimate ± SE)	4-OP 95% CI	4-NP (estimate ± SE)	4-NP 95% CI
F_{fast}	–	0.864 ± 0.314	[−0.136, 1.863]	0.048 ± 0.082	[−0.214, 0.310]
F_{slow}	–	0.105 ± 0.265	[−0.740, 0.950]	0.688 ± 0.082	[0.427, 0.950]
$F_{non,mod}$[(1)]	–	0.032 ± 0.071	[−0.195, 0.258]	0.264 ± 0.0015	[0.2590, 0.2686]
k_{fast}	h^{-1}	0.142 ± 0.044	[0.001, 0.283]	$9.718 \pm 5.38\times10^{7}$	$[-1.71\times10^{8}, 1.71\times10^{8}]$
k_{slow}	h^{-1}	0.0238 ± 0.0990	[−0.2913, 0.3389]	0.402 ± 0.028	[0.314, 0.490]
R^2	–	0.991	–	0.9997	–
RMSE[(2)]	–	0.027	–	0.002	–

[(1)] $F_{non,mod} = 1 - F_{fast} - F_{slow}$.

[(2)] RMSE is calculated as $\sqrt{(\Sigma \text{ residual}^2 / n)}$ on the fractional F_{des} (0–1 scale), i.e., not in %.

4. Detailed results of ANOVA and Tukey HSD tests

This section provides the complete outputs of the statistical analyses supporting the desorption and pot experiment results presented in the main text (Sections 3.3 and 3.4). For the desorption experiments on amended sediment, one-way ANOVAs were performed separately for each combination of compound (4-OP, 4-NP), amendment type (AC, BC, HC) and ageing time (14, 30, 90 days), with amendment dose (0.5, 1, 5, 10% w/w) as a fixed factor and the total 144-h desorbed fraction ($F_{des,144}$, % of initial concentration) as the response variable. Each treatment was represented by three parallel vials (technical replicates). Values below the practical limit of quantification (LOQ; 10% of the spiked mass) were replaced by LOQ/2 prior to analysis where necessary. At 180 days, XAD-4-extractable concentrations were <LOQ in all amended treatments, so ANOVA and Tukey HSD tests were not performed for this ageing time and these data are only interpreted descriptively in the main text.

For the pot experiment, one-way ANOVAs were conducted for shoot burdens of 4-OP and 4-NP (μg kg^{-1} sediment) with "treatment" (control, AC 0.5–10%, HC 0.5–10%) as a fixed factor and three independent pots per treatment (biological replicates). Shoot concentrations <LOQ were set to zero before calculating shoot burdens and mass balances. Where ANOVA indicated a significant treatment effect ($p < 0.05$), pairwise differences among doses or treatments were evaluated using Tukey's honestly significant difference (HSD) test.

The following tables report, for each model, the ANOVA degrees of freedom, F-statistics and p-values, together with the corresponding Tukey HSD pairwise comparisons (mean differences, 95% confidence intervals and adjusted p-values). Summary results (F and p, and the presence or absence of a significant dose/treatment effect) are presented in Tables 1 and 2 of the main text; the tables in this Supplement provide the full underlying statistical output for transparency and reproducibility.

Table S8. One-way ANOVA for the effect of amendment dose (0.5, 1, 5, 10% w/w) on total 144-h desorption ($F_{des,144}$, % of initial concentration) of 4-nonylphenol (4-NP) and 4-octylphenol (4-OP) from amended sediment after 14–90 days of ageing. $n = 3$ vials per treatment. Values <LOQ were replaced by LOQ/2 prior to analysis. Data for 180 d were not analysed by ANOVA because $F_{des,144}$ was <LOQ in all amended treatments.

Compound	Amendment	Age (d)	df between	df within	F	*p*-value	Significant dose effect ($p < 0.05$)?
4-NP	AC	14	3	8	35.452	5.7×10^{-5}	Yes
		30			73.142	3.7×10^{-6}	Yes
		90			27.376	0.000147	Yes
	BC	14			1.16	0.383215	No
		30			0.086	0.965773	No
		90			103.268	9.8×10^{-7}	Yes
	HC	14			0.048	0.985278	No

		30	0.056	0.981328	No
		90	78.531	2.8×10^{-6}	Yes
4-OP	AC	14	56.021	1.0×10^{-5}	Yes
		30	78.51	2.8×10^{-6}	Yes
		90	11.158	0.003133	Yes
	BC	14	0.177	0.908936	No
		30	0.387	0.765859	No
		90	10.313	0.004007	Yes
	HC	14	0.424	0.740923	No
		30	0.163	0.918523	No
		90	12.43	0.00222	Yes

Table S9. Tukey's honestly significant difference (HSD) post hoc comparisons for the effect of amendment dose (0.5, 1, 5, 10% w/w) on total 144-h desorption ($F_{des,144}$, % of initial concentration) of 4-NP and 4-OP from amended sediment after 14, 30, and 90 days of ageing. For each compound × amendment × ageing combination where ANOVA indicated a significant dose effect ($p < 0.05$; Table S7), all pairwise dose comparisons are reported.

Compo-und	Ame-ndment	Age (days)	Comparison	Dose 1 (% w/w)	Dose 2 (% w/w)	Mean difference in $F_{des,144}$ (percentage points)	95% CI (lower)	95% CI (upper)	Adjusted p-value	Significant ($p < 0.05$)
4-NP	AC	14	0.5 vs 1.0	0.5	1	-21.2	-34.7234	-7.6766	0.0045	1
4-NP	AC	14	0.5 vs 5.0	0.5	5	-37.5	-51.0234	-23.9766	0.0001	1
4-NP	AC	14	0.5 vs 10.0	0.5	10	-37.5	-51.0234	-23.9766	0.0001	1
4-NP	AC	14	1.0 vs 5.0	1	5	-16.3	-29.8234	-2.7766	0.0201	1
4-NP	AC	14	1.0 vs 10.0	1	10	-16.3	-29.8234	-2.7766	0.0201	1
4-NP	AC	14	5.0 vs 10.0	5	10	0	-13.5234	13.5234	1	0
4-NP	AC	30	0.5 vs 1.0	0.5	1	-25.8	-34.1275	-17.4725	0	1
4-NP	AC	30	0.5 vs 5.0	0.5	5	-31.5333	-39.8608	-23.2058	0	1
4-NP	AC	30	0.5 vs 10.0	0.5	10	-34.5	-42.8275	-26.1725	0	1
4-NP	AC	30	1.0 vs 5.0	1	5	-5.7333	-14.0608	2.5942	0.2015	0
4-NP	AC	30	1.0 vs 10.0	1	10	-8.7	-17.0275	-0.3725	0.0409	1
4-NP	AC	30	5.0 vs 10.0	5	10	-2.9667	-11.2942	5.3608	0.6767	0
4-NP	AC	90	0.5 vs 1.0	0.5	1	2.0333	1.1629	2.9038	0.0003	1
4-NP	AC	90	0.5 vs 5.0	0.5	5	2	1.1295	2.8705	0.0004	1
4-NP	AC	90	0.5 vs 10.0	0.5	10	2	1.1295	2.8705	0.0004	1
4-NP	AC	90	1.0 vs 5.0	1	5	-0.0333	-0.9038	0.8371	0.9993	0
4-NP	AC	90	1.0 vs 10.0	1	10	-0.0333	-0.9038	0.8371	0.9993	0
4-NP	AC	90	5.0 vs 10.0	5	10	0	-0.8705	0.8705	1	0
4-NP	BC	14	0.5 vs 1.0	0.5	1	14.6	-24.0232	53.2232	0.6377	0
4-NP	BC	14	0.5 vs 5.0	0.5	5	17	-21.6232	55.6232	0.5278	0
4-NP	BC	14	0.5 vs 10.0	0.5	10	21.1	-17.5232	59.7232	0.3611	0
4-NP	BC	14	1.0 vs 5.0	1	5	2.4	-36.2232	41.0232	0.997	0
4-NP	BC	14	1.0 vs 10.0	1	10	6.5	-32.1232	45.1232	0.947	0

4-NP	BC	14	5.0 vs 10.0	5	10	4.1	-34.5232	42.7232	0.9855	0
4-NP	BC	30	0.5 vs 1.0	0.5	1	1.6	-43.4045	46.6045	0.9994	0
4-NP	BC	30	0.5 vs 5.0	0.5	5	3.3	-41.7045	48.3045	0.9951	0
4-NP	BC	30	0.5 vs 10.0	0.5	10	6.8	-38.2045	51.8045	0.9606	0
4-NP	BC	30	1.0 vs 5.0	1	5	1.7	-43.3045	46.7045	0.9993	0
4-NP	BC	30	1.0 vs 10.0	1	10	5.2	-39.8045	50.2045	0.9815	0
4-NP	BC	30	5.0 vs 10.0	5	10	3.5	-41.5045	48.5045	0.9941	0
4-NP	BC	90	0.5 vs 1.0	0.5	1	12.5	7.6929	17.3071	0.0002	1
4-NP	BC	90	0.5 vs 5.0	0.5	5	-10.6	-15.4071	-5.7929	0.0005	1
4-NP	BC	90	0.5 vs 10.0	0.5	10	-9.8	-14.6071	-4.9929	0.0008	1
4-NP	BC	90	1.0 vs 5.0	1	5	-23.1	-27.9071	-18.2929	0	1
4-NP	BC	90	1.0 vs 10.0	1	10	-22.3	-27.1071	-17.4929	0	1
4-NP	BC	90	5.0 vs 10.0	5	10	0.8	-4.0071	5.6071	0.9486	0
4-NP	HC	14	0.5 vs 1.0	0.5	1	-1.1	-45.0936	42.8936	0.9998	0
4-NP	HC	14	0.5 vs 5.0	0.5	5	-3	-46.9936	40.9936	0.996	0
4-NP	HC	14	0.5 vs 10.0	0.5	10	-4.8	-48.7936	39.1936	0.9843	0
4-NP	HC	14	1.0 vs 5.0	1	5	-1.9	-45.8936	42.0936	0.999	0
4-NP	HC	14	1.0 vs 10.0	1	10	-3.7	-47.6936	40.2936	0.9926	0
4-NP	HC	14	5.0 vs 10.0	5	10	-1.8	-45.7936	42.1936	0.9991	0
4-NP	HC	30	0.5 vs 1.0	0.5	1	3	-76.2999	82.2999	0.9993	0
4-NP	HC	30	0.5 vs 5.0	0.5	5	-1.4	-80.6999	77.8999	0.9999	0
4-NP	HC	30	0.5 vs 10.0	0.5	10	-6.9	-86.1999	72.3999	0.9919	0
4-NP	HC	30	1.0 vs 5.0	1	5	-4.4	-83.6999	74.8999	0.9978	0
4-NP	HC	30	1.0 vs 10.0	1	10	-9.9	-89.1999	69.3999	0.9769	0
4-NP	HC	30	5.0 vs 10.0	5	10	-5.5	-84.7999	73.7999	0.9958	0
4-NP	HC	90	0.5 vs 1.0	0.5	1	-8.6333	-14.9394	-2.3272	0.01	1
4-NP	HC	90	0.5 vs 5.0	0.5	5	-12.3667	-18.6728	-6.0606	0.0011	1
4-NP	HC	90	0.5 vs 10.0	0.5	10	15.4	9.0939	21.7061	0.0002	1
4-NP	HC	90	1.0 vs 5.0	1	5	-3.7333	-10.0394	2.5728	0.3016	0
4-NP	HC	90	1.0 vs 10.0	1	10	24.0333	17.7272	30.3394	0	1
4-NP	HC	90	5.0 vs 10.0	5	10	27.7667	21.4606	34.0728	0	1
4-OP	AC	14	0.5 vs 1.0	0.5	1	-23.5	-34.6762	-12.3238	0.0007	1
4-OP	AC	14	0.5 vs 5.0	0.5	5	-36	-47.1762	-24.8238	0	1
4-OP	AC	14	0.5 vs 10.0	0.5	10	-41.6	-52.7762	-30.4238	0	1
4-OP	AC	14	1.0 vs 5.0	1	5	-12.5	-23.6762	-1.3238	0.0294	1
4-OP	AC	14	1.0 vs 10.0	1	10	-18.1	-29.2762	-6.9238	0.0037	1
4-OP	AC	14	5.0 vs 10.0	5	10	-5.6	-16.7762	5.5762	0.4277	0
4-OP	AC	30	0.5 vs 1.0	0.5	1	-8.5	-17.4828	0.4828	0.0637	0
4-OP	AC	30	0.5 vs 5.0	0.5	5	-31.9	-40.8828	-22.9172	0	1
4-OP	AC	30	0.5 vs 10.0	0.5	10	-36	-44.9828	-27.0172	0	1
4-OP	AC	30	1.0 vs 5.0	1	5	-23.4	-32.3828	-14.4172	0.0001	1
4-OP	AC	30	1.0 vs 10.0	1	10	-27.5	-36.4828	-18.5172	0	1
4-OP	AC	30	5.0 vs 10.0	5	10	-4.1	-13.0828	4.8828	0.5	0
4-OP	AC	90	0.5 vs 1.0	0.5	1	1.2333	0.0616	2.4051	0.0395	1

4-OP	AC	90	0.5 vs 5.0	0.5	5	1.8333	0.6616	3.0051	0.0046	1
4-OP	AC	90	0.5 vs 10.0	0.5	10	1.8333	0.6616	3.0051	0.0046	1
4-OP	AC	90	1.0 vs 5.0	1	5	0.6	-0.5718	1.7718	0.4109	0
4-OP	AC	90	1.0 vs 10.0	1	10	0.6	-0.5718	1.7718	0.4109	0
4-OP	AC	90	5.0 vs 10.0	5	10	0	-1.1718	1.1718	1	0
4-OP	BC	14	0.5 vs 1.0	0.5	1	8.1	-40.3016	56.5016	0.9478	0
4-OP	BC	14	0.5 vs 5.0	0.5	5	-1.8	-50.2016	46.6016	0.9993	0
4-OP	BC	14	0.5 vs 10.0	0.5	10	4.7	-43.7016	53.1016	0.9888	0
4-OP	BC	14	1.0 vs 5.0	1	5	-9.9	-58.3016	38.5016	0.9109	0
4-OP	BC	14	1.0 vs 10.0	1	10	-3.4	-51.8016	45.0016	0.9957	0
4-OP	BC	14	5.0 vs 10.0	5	10	6.5	-41.9016	54.9016	0.9716	0
4-OP	BC	30	0.5 vs 1.0	0.5	1	-2.4	-42.2816	37.4816	0.9972	0
4-OP	BC	30	0.5 vs 5.0	0.5	5	-12.1	-51.9816	27.7816	0.7688	0
4-OP	BC	30	0.5 vs 10.0	0.5	10	-1.6	-41.4816	38.2816	0.9992	0
4-OP	BC	30	1.0 vs 5.0	1	5	-9.7	-49.5816	30.1816	0.8619	0
4-OP	BC	30	1.0 vs 10.0	1	10	0.8	-39.0816	40.6816	0.9999	0
4-OP	BC	30	5.0 vs 10.0	5	10	10.5	-29.3816	50.3816	0.8329	0
4-OP	BC	90	0.5 vs 1.0	0.5	1	4.3	-5.2768	13.8768	0.5126	0
4-OP	BC	90	0.5 vs 5.0	0.5	5	-11.3	-20.8768	-1.7232	0.0225	1
4-OP	BC	90	0.5 vs 10.0	0.5	10	-5.7	-15.2768	3.8768	0.2978	0
4-OP	BC	90	1.0 vs 5.0	1	5	-15.6	-25.1768	-6.0232	0.0036	1
4-OP	BC	90	1.0 vs 10.0	1	10	-10	-19.5768	-0.4232	0.041	1
4-OP	BC	90	5.0 vs 10.0	5	10	5.6	-3.9768	15.1768	0.3105	0
4-OP	HC	14	0.5 vs 1.0	0.5	1	6	-53.5659	65.5659	0.9875	0
4-OP	HC	14	0.5 vs 5.0	0.5	5	-9.8	-69.3659	49.7659	0.9501	0
4-OP	HC	14	0.5 vs 10.0	0.5	10	-12.4	-71.9659	47.1659	0.9067	0
4-OP	HC	14	1.0 vs 5.0	1	5	-15.8	-75.3659	43.7659	0.8299	0
4-OP	HC	14	1.0 vs 10.0	1	10	-18.4	-77.9659	41.1659	0.7596	0
4-OP	HC	14	5.0 vs 10.0	5	10	-2.6	-62.1659	56.9659	0.9989	0
4-OP	HC	30	0.5 vs 1.0	0.5	1	3.7	-47.1383	54.5383	0.9952	0
4-OP	HC	30	0.5 vs 5.0	0.5	5	10.7	-40.1383	61.5383	0.904	0
4-OP	HC	30	0.5 vs 10.0	0.5	10	3	-47.8383	53.8383	0.9974	0
4-OP	HC	30	1.0 vs 5.0	1	5	7	-43.8383	57.8383	0.9696	0
4-OP	HC	30	1.0 vs 10.0	1	10	-0.7	-51.5383	50.1383	1	0
4-OP	HC	30	5.0 vs 10.0	5	10	-7.7	-58.5383	43.1383	0.9603	0
4-OP	HC	90	0.5 vs 1.0	0.5	1	-7.4	-18.0146	3.2146	0.1941	0
4-OP	HC	90	0.5 vs 5.0	0.5	5	-5	-15.6146	5.6146	0.4757	0
4-OP	HC	90	0.5 vs 10.0	0.5	10	11.2	0.5854	21.8146	0.039	1
4-OP	HC	90	1.0 vs 5.0	1	5	2.4	-8.2146	13.0146	0.8848	0
4-OP	HC	90	1.0 vs 10.0	1	10	18.6	7.9854	29.2146	0.0022	1
4-OP	HC	90	5.0 vs 10.0	5	10	16.2	5.5854	26.8146	0.0053	1

Table S10. One-way ANOVA for the effect of treatment (control, AC 0.5–10%, HC 0.5–10%) on maize shoot burdens of 4-OP and 4-NP (µg kg^{-1} sediment) in the pot experiment. n = 3 pots per treatment. Shoot concentrations <LOQ were set to zero before calculating shoot burdens.

Compound	df between (treatment)	df within	F	p-value	Significant treatment effect ($p < 0.05$)?
4-OP	8	18	15.325	1.4×10^{-6}	Yes
4-NP	8	18	9.642	3.9×10^{-5}	Yes

Table S11. Tukey's honestly significant difference (HSD) post hoc comparisons for the effect of treatment (control, AC 0.5–10%, HC 0.5–10%) on maize shoot burdens of 4-OP and 4-NP (µg kg^{-1} sediment) in the pot experiment. Comparisons are reported for all pairs of treatments for each compound.

Compound	Comparison – Dose 1 vs. Dose 2 (% w/w)	Mean difference in shoot burden (µg kg^{-1} sediment)	95% CI (lower)	95% CI (upper)	Adjusted p-value	Significant ($p < 0.05$)
4-OP	AC 0.5% vs. AC 1%	21.4033	7.891	34.9156	0.0008	1
4-OP	AC 0.5% vs. AC 10%	-1.2	-14.7123	12.3123	1	0
4-OP	AC 0.5% vs. AC 5%	-8.8967	-22.409	4.6156	0.3869	0
4-OP	AC 0.5% vs. HC% vs. HC 0.5 %	-7.1033	-20.6156	6.409	0.6569	0
4-OP	AC 0.5% vs. HC% vs. HC 1%	-13.7033	-27.2156	-0.191	0.0454	1
4-OP	AC 0.5% vs. HC% vs. HC 10%	-13.7033	-27.2156	-0.191	0.0454	1
4-OP	AC 0.5% vs. HC% vs. HC 5 %	-8.3	-21.8123	5.2123	0.4719	0
4-OP	AC 0.5% vs. SP% vs. SP	-2.4	-15.9123	11.1123	0.9992	0
4-OP	AC 1% vs. AC 10%	-22.6033	-36.1156	-9.091	0.0004	1
4-OP	AC 1% vs. AC 5%	-30.3	-43.8123	-16.7877	0	1
4-OP	AC 1% vs. HC% vs. HC 0.5 %	-28.5067	-42.019	-14.9944	0	1
4-OP	AC 1% vs. HC% vs. HC 1%	-35.1067	-48.619	-21.5944	0	1
4-OP	AC 1% vs. HC% vs. HC 10%	-35.1067	-48.619	-21.5944	0	1
4-OP	AC 1% vs. HC% vs. HC 5 %	-29.7033	-43.2156	-16.191	0	1
4-OP	AC 1% vs. SP% vs. SP	-23.8033	-37.3156	-10.291	0.0002	1
4-OP	AC 10% vs. AC 5%	-7.6967	-21.209	5.8156	0.5643	0
4-OP	AC 10% vs. HC% vs. HC 0.5 %	-5.9033	-19.4156	7.609	0.8274	0
4-OP	AC 10% vs. HC% vs. HC 1%	-12.5033	-26.0156	1.009	0.0826	0
4-OP	AC 10% vs. HC% vs. HC 10%	-12.5033	-26.0156	1.009	0.0826	0
4-OP	AC 10% vs. HC% vs. HC 5 %	-7.1	-20.6123	6.4123	0.6575	0
4-OP	AC 10% vs. SP% vs. SP	-1.2	-14.7123	12.3123	1	0

4-OP	AC 5% vs. HC% vs. HC 0.5 %	1.7933	-11.719	15.3056	0.9999	0
4-OP	AC 5% vs. HC% vs. HC 1%	-4.8067	-18.319	8.7056	0.9344	0
4-OP	AC 5% vs. HC% vs. HC 10%	-4.8067	-18.319	8.7056	0.9344	0
4-OP	AC 5% vs. HC% vs. HC 5 %	0.5967	-12.9156	14.109	1	0
4-OP	AC 5% vs. SP% vs. SP	6.4967	-7.0156	20.009	0.7479	0
4-OP	HC 0.5 % vs. HC 1%	-6.6	-20.1123	6.9123	0.733	0
4-OP	HC 0.5 % vs. HC 10%	-6.6	-20.1123	6.9123	0.733	0
4-OP	HC 0.5 % vs. HC 5 %	-1.1967	-14.709	12.3156	1	0
4-OP	HC 0.5 % vs. SP	4.7033	-8.809	18.2156	0.9415	0
4-OP	HC 1% vs. HC% vs. HC 10%	0	-13.5123	13.5123	1	0
4-OP	HC 1% vs. HC% vs. HC 5 %	5.4033	-8.109	18.9156	0.8834	0
4-OP	HC 1% vs. SP% vs. SP	11.3033	-2.209	24.8156	0.1454	0
4-OP	HC 10% vs. HC% vs. HC 5 %	5.4033	-8.109	18.9156	0.8834	0
4-OP	HC 10% vs. SP% vs. SP	11.3033	-2.209	24.8156	0.1454	0
4-OP	HC 5 % vs. SP	5.9	-7.6123	19.4123	0.8278	0
4-NP	AC 0.5% vs. AC 1%	22.5967	-7.6316	52.8249	0.2446	0
4-NP	AC 0.5% vs. AC 10%	-16.8033	-47.0316	13.4249	0.5933	0
4-NP	AC 0.5% vs. AC 5%	-26.9033	-57.1316	3.3249	0.1039	0
4-NP	AC 0.5% vs. HC% vs. HC 0.5 %	2.2967	-27.9316	32.5249	1	0
4-NP	AC 0.5% vs. HC% vs. HC 1%	-11.2033	-41.4316	19.0249	0.9192	0
4-NP	AC 0.5% vs. HC% vs. HC 10%	-34.1067	-64.3349	-3.8784	0.0204	1
4-NP	AC 0.5% vs. HC% vs. HC 5 %	-12.1067	-42.3349	18.1216	0.8825	0
4-NP	AC 0.5% vs. SP% vs. SP	17.2967	-12.9316	47.5249	0.5588	0
4-NP	AC 1% vs. AC 10%	-39.4	-69.6282	-9.1718	0.0058	1
4-NP	AC 1% vs. AC 5%	-49.5	-79.7282	-19.2718	0.0005	1
4-NP	AC 1% vs. HC% vs. HC 0.5 %	-20.3	-50.5282	9.9282	0.3633	0
4-NP	AC 1% vs. HC% vs. HC 1%	-33.8	-64.0282	-3.5718	0.0219	1
4-NP	AC 1% vs. HC% vs. HC 10%	-56.7033	-86.9316	-26.4751	0.0001	1
4-NP	AC 1% vs. HC% vs. HC 5 %	-34.7033	-64.9316	-4.4751	0.0177	1
4-NP	AC 1% vs. SP% vs. SP	-5.3	-35.5282	24.9282	0.9993	0
4-NP	AC 10% vs. AC 5%	-10.1	-40.3282	20.1282	0.953	0
4-NP	AC 10% vs. HC% vs. HC 0.5 %	19.1	-11.1282	49.3282	0.4371	0
4-NP	AC 10% vs. HC% vs. HC 1%	5.6	-24.6282	35.8282	0.9989	0
4-NP	AC 10% vs. HC% vs. HC 10%	-17.3033	-47.5316	12.9249	0.5583	0
4-NP	AC 10% vs. HC% vs. HC 5 %	4.6967	-25.5316	34.9249	0.9997	0

4-NP	AC 10% vs. SP% vs. SP	34.1	3.8718	64.3282	0.0204	1
4-NP	AC 5% vs. HC% vs. HC 0.5 %	29.2	-1.0282	59.4282	0.063	0
4-NP	AC 5% vs. HC% vs. HC 1%	15.7	-14.5282	45.9282	0.6701	0
4-NP	AC 5% vs. HC% vs. HC 10%	-7.2033	-37.4316	23.0249	0.9939	0
4-NP	AC 5% vs. HC% vs. HC 5 %	14.7967	-15.4316	45.0249	0.7309	0
4-NP	AC 5% vs. SP% vs. SP	44.2	13.9718	74.4282	0.0018	1
4-NP	HC 0.5 % vs. HC 1%	-13.5	-43.7282	16.7282	0.8109	0
4-NP	HC 0.5 % vs. HC 10%	-36.4033	-66.6316	-6.1751	0.0118	1
4-NP	HC 0.5 % vs. HC 5 %	-14.4033	-44.6316	15.8249	0.7563	0
4-NP	HC 0.5 % vs. SP	15	-15.2282	45.2282	0.7175	0
4-NP	HC 1% vs. HC% vs. HC 10%	-22.9033	-53.1316	7.3249	0.2312	0
4-NP	HC 1% vs. HC% vs. HC 5 %	-0.9033	-31.1316	29.3249	1	0
4-NP	HC 1% vs. SP% vs. SP	28.5	-1.7282	58.7282	0.0736	0
4-NP	HC 10% vs. HC% vs. HC 5 %	22	-8.2282	52.2282	0.2724	0
4-NP	HC 10% vs. SP% vs. SP	51.4033	21.1751	81.6316	0.0003	1
4-NP	HC 5 % vs. SP	29.4033	-0.8249	59.6316	0.0602	0

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