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Mercury distribution and mobilization in sediments by the use of prescribed firesin the *Hakea sericea* alien species exclusion in Central Portugal

Melissa Méndez-López (1,2), Andrea Parente-Sendín (1,2), Noemi Calvo-Portela (1, 2), Isabel Campos (3), Joaquim S. Silva (4, 5), Juan Carlos Nóvoa-Muñoz (1, 2*), Óscar González-Pelayo (3, 6),Flora Alonso Vega (1,2).

(1) Universidade de Vigo, Departamento de Bioloxía Vexetal e Ciencia do Solo, Área de Edafoloxía e Química Agrícola, Facultade de Ciencias. As Lagoas s/n, 32004 Ourense, Spain.
(2) Campus da Auga, Universidade de Vigo, Laboratorio de Tecnoloxía e Diagnose Ambiental. Rúa Canella da Costa da Vela 12, 32004, Ourense, Spain.
(3) Centre for Environmental and Marine Studies (CESAM), Department of Environment and Planning, University of Aveiro, Campus Universitario de Santiago, 3810-193 Aveiro, Portugal.
(4) Centre for Functional Ecology, University of Coimbra, 3000-456 Coimbra, Portugal
(5) College of Agriculture, Polytechnic of Coimbra, 3045-601 Coimbra, Portugal
(6) University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development, Pólo da Mitra, Ap. 94, 7006 Évora, Portugal
*Corresponding author: edjuanca@uvigo.es

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Abstract (100-400 words)

This studydeterminesthe distribution ofHg, a global contaminant,among different size-fractions of sediments mobilized after a prescribed burn carried out to control an alien plant species (*Hakea sericea*) in Central Portugal. In an area invaded by *H. sericea*nine 10 m^2plots were exposed to a burn (B),to a slash and burn (S&B) and control non-burned (C) treatments. Sediments mobilized from each plot were collected after the first four rainfall events (from July to December 2019). Sediment samples were dried (40 ºC) and then sieved (2 mm mesh) to obtain the bulk sediment fraction, which was further separated into three size fractions (0.5-2 mm; 0.2-0.5 mm and <0.2 mm). The mass of each size-fraction wasnoted.Total Hg (THg) was determined in the 96 samples obtained (6 plots x 4 times x 4 sediment fractions)using a total Hg analyzer, and the Hg mobilizedwith sediments was estimated on an area basis.

Mean THg in bulk sediments (< 2mm) wasslightly higher in samples from B plotsthan from S&B ones (range 33-88 µg kg^{-1}). Control non-burned treatment did not produce sediments. Total Hg correlated withthe C/N ratio (rho = -0.705, p = 0.000; n = 24)suggestingan influence of organic matter humification on THg values. Total Hg was 1.9 (in B plots) and 2.3 (in S&B plots) times higher after the last rainfallevent (December) compared to the firstone (July), being consistent with the amount of precipitation in both events (44 vs 196 mm). Sediment size-fractionsof 0.2-0.5 and <0.2 mm showedhigher THg concentrations (range 46-115 µg kg^{-1}) than that of 0.5-2 mm (range 33-68 µg kg^{-1}), but no statistically significant differences were found between B and S&B treatments.

Mercury mobilization through the bulk sediment fraction (<2 mm) was higher in B plots (0.3-10.3 mg Hg ha^{-1}) than in S&B plots (0.1-2.2 mg Hg ha^{-1}), but far from estimates obtained in previous studies [1]. For 0.5-2 and 0.2-0.5 mm size-fractions, Hg mobilized from B plots was statistically greater than that from S&B plots, a circumstance that did not occur for the <0.2 mm fraction, presumably due to its low mass contribution. Mercury mobilization through sediments increased considerably with rainfall, peaking after the last event in December 2019.As consequence, Hg mobilized jointly with sediments could endanger the biota of freshwater ecosystems and reduce water quality.

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