

Species Selection for Phytoremediation of Barium Polluted Flooded Soils

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Abstract : The use of barite (BaSO_4) as a weighting agent in drilling fluids for oil and gas activities makes barium a potential contaminant in the case of spills onto flooded soils, where barium sulfate solubility is increased due to low redox conditions. In order to select plants able to remove barium in such scenarios, seven plant species were evaluated on barium phytoextraction capacity: *Brachiaria arrecta*; *Cyperus cf. papyrus*; *Eleocharis acutangula*; *Eleocharis interstincta*; *Nephrolepis cf. rivularis*; *Paspalum conspersum* and *Typha domingensis*. Plants were grown in pots with 13 kg of soil each, and exposed to six barium concentrations (established with BaCl_2): 0; 2.5; 5.0; 10.0; 30.0; 65.0 mg kg⁻¹. To simulate flooding conditions, every pot was maintained with a thin irrigation water depth over soil surface (~1.0 cm). Treatments were carried out in triplicate, and pots were distributed randomly inside the greenhouse. Biometric and chemical analyses were performed throughout the experiment, including Ba^{2+} accumulation in shoots and roots. The highest amount of barium was observed in *T. domingensis* biomass, followed by *C. cf. papyrus*. However, the latter exported most of the barium to shoot, especially in higher BaCl_2 doses, while the former accumulated barium preferentially in roots. Thus, barium removal with *C. cf. papyrus* could be achieved by simply harvesting aerial biomass. The amount of barium in *C. cf. papyrus* was a consequence of high biomass production rather than barium concentration in plant tissues, whereas *T. domingensis* showed high barium concentration in plant tissues and high biomass production as well. These results make *T. domingensis* and *C. cf. papyrus* potential candidates to be applied in phytoremediation schemes to remove barium from flooded soils.

Keywords : barium sulfate, cyperus, drilling fluids, phytoextraction, Typha

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