Response of energy willow (*Salix viminalis*) to soil contamination with cadmium and lead

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Many authors have investigated the applicability of willow (*Salix viminalis*) for remediation of soils contaminated with various metals. In general, however, they deal with the process of phytoextraction and often discuss experiments conducted in water solutions or in pots. The purpose of this study was to determine the tolerance of willow to soil contamination with Cd and Pb and to evaluate the applicability of willow to soil remediation via phytostabilization. In a two-year micro plot experiment conducted on sandy and loess soils contaminated with Cd and Pb, the response of energy willow to these metals has been analyzed as well as the results of soil reclamation using two rates of peat. Differences have been observed between the soils, both in terms of the response of plants to pollutants and the effect of the applied peat. Contamination of sandy soil with Cd and Pb led to complete necrosis of plants whereas the yield of willow plants obtained on loess was comparable to the control. The application of peat to sandy soil limited the transport of metals by willow plants to aerial part, restoring the intensity of photosynthesis to a comparable level, as in the control treatment. Willow (*Salix viminalis*), grown on loess soil was more tolerant to concomitant contamination of soil with Cd and Pb than grown on sandy soil, where it responded to the contamination by depressing yields and accumulating the metals mainly in aerial parts. This observation indicates that willow is useful for phytostabilization of these metals predominantly on heavier soils. Use of willow for phytostabilization of metals on light soils is possible if the soil is amended with an appropriate rate of peat.

Table . Yield of willow (Salix viminalis)

	Treatment	Twigs	
		g · m^{-2}	%
Sand	Control	2857 a	100
	(Cd+Pb)	3 b	1
	(Cd+Pb) + peat 1	2869 a	100
	(Cd+Pb) + peat 2	2718 a	95
Loess	Control	2499 b	100
	(Cd+Pb)	2662 b	107
	(Cd+Pb) + peat 1	3047 a	122
	(Cd+Pb) + peat 2	2676 b	107

Identical letters indicate no significant difference according to Tukey's test (P=0.05)

Recent Publications

1. Harper C (2009) The neuropathology of alcohol-related brain damage. Alcohol Alcohol 44(2):136-140.
2. Li X, Schwacha M G, Chaudry I H and Choudhry M A (2008) Acute alcohol intoxication potentiates neutrophil-mediated intestinal tissue damage after burn injury. Shock 29(3):377-383.
3. Sullivan E V and Zahr N M (2008) Neuroinflammation as a neurotoxic mechanism in alcoholism: Commentary on "Increased MCP- 1 and microglia in various regions of human alcoholic brain". Experimental neurology 213(1):10-17.

4. Heilig M and Egli M (2006) Pharmacological treatment of alcohol dependence: Target symptoms and target mechanisms. Pharmacology and therapeutics 111(3):855-876.
5. Room R, BaborT, Rehm J (2005) Alcohol and public health. Lancet 365(9458):519-530.

Biography

Ewa Stanislawska-Glubiak is a Professor in the Institute of Soil Science and Plant Cultivation at National Research Institute. Her main field of research involves plant response to heavy metals, the ways of the reduction in phytoremediation of heavy metals from contaminated soils, as well as she conducts research on making use of waste materials in agriculture and soils remediation. She also works on developing diagnostics methods for the assessment of soil richness in microelements and works on recommendations regarding micronutrient fertilization. She also determines the composition of new microelement fertilizers, testing their yield forming effectiveness. She is the Author of about 150 scientific publications and numerous popular science publications.

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