Lead Hyperaccumulation and Tolerance in *Eremochloa ophiuroides* and *Paspalum vaginatum*

Yanhua Zhu
Shanghai Jiaotong University, China

Zhaolong Wang
Shanghai Jiaotong University, China

Bingru Huang
Shanghai Jiaotong University, China

The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Lead hyperaccumulation and tolerance in *Eremochloa ophiuroides* and *Paspalum vaginatum*

Yanhua Zhu Zhaolong Wang and Bingru Huang*
*School of Agriculture & Biology, Shanghai JiaoTong University, Shanghai 201101, P.R.China, E-mail: turf@sjtu.edu.cn, * Corresponding author.*

Key words: eremochloa ophiuroides, Paspalum vaginatum, lead phytoremediation, phytostabilization

Introduction Soil lead (Pb) contamination is one of the more serious environmental problems, with significant impact on human health. The success of phytoremediation for Pb-contaminated soil is mainly dependent on using efficient plants (Pilon-Smits E., 2005). Turfgrasses can effectively control contamination from soil erosion and reduce the chance for human contact with pollutants (Bacon et al., 2005). In the present study, *Eremochloa ophiuroides* and *Paspalum vaginatum* were selected to: (1) examine whether they can tolerant high doses of Pb in contaminated soil; and (2) investigate the efficiency of Pb extraction and accumulation by the two turfgrass species.

Materials and methods Two-year turf sod of *E. ophiuroides* and *P. vaginatum* were planted in plastic pots (18 cm in diameter and 15 cm deep) filled with 2.5 kg of a soil mixture contaminated with (5000 mg kg^{-1}) and a clean soil control with background Pb concentration of 28.02 mg kg^{-1}. Two turfgrass species: *E. ophiuroides* and *P. vaginatum*, were planted in each. The pots were arranged in a randomized complete block design with 4 replicates. Turfgrass canopy photosynthetic rate, leaf chlorophyll content, shoot density, turf quality, shoot and root biomass, and plant Pb concentration were measured.

Results Both *E. ophiuroides* and *P. vaginatum* showed excellent tolerance of Pb contamination in the experiment. No significant toxicity symptoms (chlorosis, burning of leaf magins, leaf abscission and shoot dieback) were observed in both grasses. Pb treatment did not show any significant difference in leaf chlorophyll content and shoot density in both grasses. Turf visual quality of *P. vaginatum* did not show any significant difference between Pb treatment and the control, but *E. ophiuroides* showed a decrease of turf visual quality (Table 1). *P. vaginatum* and *E. ophiuroides* accumulated over 7 times and 4 times more Pb concentrations in roots than in the soil when grown in the Pb contaminated soil (Table 2). However, the root:shoot ration was 16.78% in P. vaginatum plant, but 58.13% in E. ophiuroides.

Table 1 *Effects of Pb on the growth of turfgrass plants.*

Turfgrass species	Treatment	Phytosynthetic rate (μmol CO_2 m^{-2} s^{-1})	Chlorophyll content (mg g^{-1})	Shoot density (tillers/100 cm^{-2})	Turf visual quality
E.ophiuroides	Control	8.59b†	248.8a	51.0a	6.0a
	Pb contaminated soil	12.26a	252.5a	60.3a	4.3b
P.Vaginatum	Control	9.57b	319.0a	161a	8.0a
	Pb contaminated soil	11.32a	313.0a	153a	9.0a

† Means followed by the different letters (a, b) were significantly different between Pb contaminated soil and the control within the same species on the basis of LSD test (P=0.05).

Table 2 *Pb uptake and distribution in turfgrass plants.*

Turfgrass species	Treatment	Pb concentration (mg kg^{-1} DW)			Root to shoot transfer rate(%)
		Soil	Root	Shoot	
E.ophiuroides	Control	28±3.5	107±22	72±12.5	
	Pbcontaminated soil	5097±754	18139±1053	10545±38	58.13
P.Vaginatum	Control	28±3.5	68±1.3	27±3.0	
	Pbcontaminated soil	4118±99	29306±116	4918±556	16.78

Conclusion *E. ophiuroides* and *P. vaginatum* have good potential for phytoextraction of Pb contaminated soils.