

"Arsenic hyperaccumulation by *Pteris vittata* L.: Mechanism and application"

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Arsenic is of great environmental concern due to its extensive contamination and carcinogenic toxicity. Anthropogenic activities have resulted in numerous arsenic contaminated sites worldwide. The arsenic hyperaccumulator *Pteris vittata* L. (Chinese Brake fern) has many desirable attributes for use in phytoremediation of arsenic-contaminated soils (Ma et al., 2001). Our research approaches involve an integration of greenhouse studies, chemical speciation, electron microscope analysis, advanced spectroscopy, and pilot-scale field demonstration. Chinese Brake fern is an efficient arsenic hyperaccumulator with a bioconcentration factor (arsenic concentration ratio of plant to soil) of up to 200 and a translocation factor of up to 42 (arsenic concentration ratio in fronds to roots). The fern was efficient in taking up arsenic from uncontaminated (up to 755 mg kg⁻¹ in fronds) as well as contaminated soils (up to 2.3% in fronds) from both roots and fronds, and by live and excised plants regardless arsenic species (organic/inorganic or arsenate/arsenite) and concentrations (0.5 to 1,600 mg kg⁻¹). Our pilot-scale field demonstration shows that the plant was effective in removing arsenic from the soil (14%) after two seasons. The plant's abilities to produce large quantities of root exudates (to solubilize soil arsenic), to produce large root biomass (>fronds), to effectively translocate arsenic to the fronds (up to 95%), to reduce arsenic from arsenate-AsV to arsenite-AsIII (up to 100% arsenite) in the fronds, and to keep high concentration of P in the roots have all contributed to its capability to hyperaccumulate arsenic, making it a good candidate for use in phytoremediation of arsenic contaminated sites.

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