Uptake Kinetics of Arsenate by Arsenic Hyperaccumulator Brake Fern as Influenced by P Nutrition. (S11-tu102249-Oral)

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Abstract:

Uptake kinetics of arsenate by intact plant of Chinese Brake fern (Pteris vittata), a newly-discovered arsenic hyperaccumulator, and Boston fern (Nephrolepis exaltata), a non-hyperaccumulator, was characterized by employing an ion depletion method. Two levels of arsenate (0.1 and 1mM) and four levels of phosphate (0, 0.1, 0.5 and 1 mM) were used. At low arsenate, arsenate uptake rates were similar for both ferns. However, at high arsenate, arsenate uptake rates (0.090~0.104 mmol g-1 root DW h-1) of Chinese brake are greater than the Boston fern (0.035~0.060 mmol g-1 root DW h-1). The Km and Cmin values for Chinese Brake were significantly lower than the Boston fern, indicating a stronger affinity of Chinese Brake for arsenate and a greater ability to absorb arsenate than the Boston fern. In both ferns, addition of phosphate reduced their affinity for arsenate and its uptake rate and accumulation. The distribution pattern of As and P between the two ferns differed with the occurrence of a low P/As ratio in the fronds and a high P/As ratio in the roots of Chinese Brake, whereas, the opposite occurred in Boston fern. This study suggested that arsenic hyperaccumulation by Chinese Brake was facilitated by its high root P/As ratio, which triggered high influx rates of and high affinity for arsenate.

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