

Boron stress response and accumulation potential of the extremely tolerant species *Puccinellia frigida*

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Abstract

Phytoremediation is a promising technology to tackle boron toxicity, which restricts agricultural activities in many arid and semi-arid areas. *Puccinellia frigida* is a perennial grass that was reported to hyperaccumulate boron in extremely boron-contaminated sites. To further investigate its potential for phytoremediation, we determined its response to boron stress under controlled conditions (hydroponic culture). Also, as a first step towards understanding the mechanisms underlying its extreme tolerance, we evaluated the presence and expression of genes related with boron tolerance. We found that *P. frigida* grew normally even at highly toxic boron concentrations in the medium (500 mg/L), and within its tissues (>5000 mg/kg DW). We postulate that the strategies conferring this extreme tolerance involve both restricting boron accumulation and an internal tolerance mechanism; this is consistent with the identification of putative genes involved in both mechanisms, including the expression of a possible boron efflux transporter. We also found that *P. frigida* hyperaccumulated boron over a wide range of boron concentrations. We propose that *P. frigida* could be used for boron phytoremediation strategies in places with different soil characteristics and boron concentrations. Further studies should pave the way for the development of clean and low-cost solutions to boron toxicity problems..