ZINC PHYTOEXTRACTION BY INDIAN MUSTARD AS INFLUENCED BY NITROGEN AND PHOSPHORUS NUTRITION

Abstract

Mineral nutrition influences plant growth and absorption of elements, which are two factors that influence the ability of plants to accumulate metals in tissues. Proper nutrition enhance Zn accumulation and enhance the potential for plant-based remediation methods such as phytoextraction. Our objectives were to determine the effects of N and P supply on growth and accumulation of Zn by Indian mustard (*Brassica juncea* Czern.) under simulated Zn-contaminated conditions. In a factorial experiment, *B. juncea* (accession 426308) was supplied with five levels of N (50, 150, 250, 350, and 450 mg L^{-1}) in combination with four levels of P (5, 20, 35, and 50 mg L^{-1}) for three weeks in solution culture. All solutions contained 3.0 mg Zn L^{-1}, a level of Zn determined to cause Zn toxicity in *B. juncea*. Shoot dry mass increased from 9.6 to 14.0 g $plant^{-1}$ with increasing supply of N up to 150 mg N L^{-1}, but dry mass was not increased further at higher levels of N exposure. Plant growth was not influenced by the supply of P in solutions. Mean shoot Zn concentration increased from 483 to 680 µg g^{-1} as the N concentration in solution increased from 50 to 350 mg N L^{-1}, and shoot Zn concentration increased from 580 to 674 µg g^{-1} as the P supply in solution increased from 5 to 50 mg L^{-1}. The Zn content (mg $plant^{-1}$) of *B. juncea* shoots increased by 100% (from 4.6 to 9.3 mg Zn $plant^{-1}$) as the supply of N increased from 50 to 350 mg L^{-1}, and by 20% (from 7.3 to 8.8 mg Zn $plant^{-1}$) as the supply of P increased from 5 to 50 mg L^{-1}. Iron concentrations in *B. juncea* roots increased, and concentrations in leaves decreased with increasing supply of P, indicating that plants may be more prone to Fe deficiency with increased P fertility. Results suggest that N fertility can be used to increase the Zn phytoextraction potential of *B. juncea*, but supplying P in excess of plant growth requirements does not enhance Zn phytoextraction.