Effect of salinity on the uptake of cadmium by the hyperaccumulator Carpobrotus rossii

Mrs Miaomiao Cheng[1], Professor Caixian Tang[1]
[1]*La Trobe University*

Cadmium (Cd) is one of the most toxic pollutants in the landscape impacting deleteriously on humans, animals and plants. Phytoremediation of Cd-contaminated soils with hyperaccumulating plants is considered to be the most promising technique, especially for moderately polluted soils. However, most plants used for Cd phytoextraction are glycophytes and are not suitable to remediate Cd-contaminated saline soils. Australian native halophyte Carpobrotus rossii has been shown to tolerate a mixture of heavy metals and to hyperaccumulate Cd. However, limited information is available on the effect of salinity on Cd phytoextraction and associated mechanism in this species. This study examined the effect of NaCl on Cd accumulation, translocation, and speciation in C. rossii. Plants were grown in nutrient solution with different levels of NaCl in the presence of 5 or 15 µM Cd. Plant growth and Cd uptake were measured, and Cd speciation was analyzed using synchrotron-based X-ray absorption spectroscopy. The results showed that the plant growth was restricted only under high salinity (400 mM NaCl). The addition of 50 mM NaCl decreased total Cd uptake per plant by 1.4-fold when the plants were grown at 15 µM Cd. Interestingly, the addition of NaCl decreased Cd concentration in shoots by 5-fold but did not affect Cd concentrations in the roots, resulting in a decrease in Cd translocation from roots to shoots. This decrease in Cd translocation was not due to changes in Cd speciation within the plant tissues. Regardless of NaCl treatment, Cd-S was the dominant species in all tissues except the xylem sap where 87–95% were Cd-OH complexes. It is concluded that salinity decreased shoot Cd accumulation by decreasing uptake and translocation.