

Distribution of zinc and/or cadmium treatments in *Gynura pseudochina* (L.) DC. biomass

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1. Introduction

Gynura pseudochina (L.) DC. is a Zn/Cd hyperaccumulative plant. The dose effects on the morphology and dry weight indicated that Cd toxicity was alleviated by the Zn [1-2]. The concentrations of Zn and Cd under the tolerance limits induced the plants to increase their antioxidant activity. The main part distribution of Zn and Cd was correlated with antioxidant activity in the biomass. Confocal laser scanning microscopy (CLSM) and micro X-ray fluorescence (μ -XRF) imaging revealed that the accumulation of Zn and Cd in the cell wall involves flavonoid compounds.

2. Experiment

Four week old healthy plants were selected and treated with Zn and/or Cd under a tissue culture system. The plant samples were separately treated for two weeks the Zn solution (1000 mg L⁻¹), Cd solution (150 mg L⁻¹) and Zn/Cd solution (1000/150 mg L⁻¹). Distributions of metals in the plant tissue were studied by μ -XRF imaging analysis. The samples were prepared as a thin sample with a constant thickness (200-300 μ m) to obtain a precise elemental distribution. X-ray beam energy of approximately 30 keV was focused into a microbeam (1.8 x 2.1 mm²), step size (5 x 5 mm) and a measurement time of 0.3 s per point. The X-ray beam energy of 11.1 keV on the BL-4A. The Cd K-edge and Zn K-edge XANES spectra were recorded in a fluorescent mode at the NW10A and BL-12C of KEK-PF.

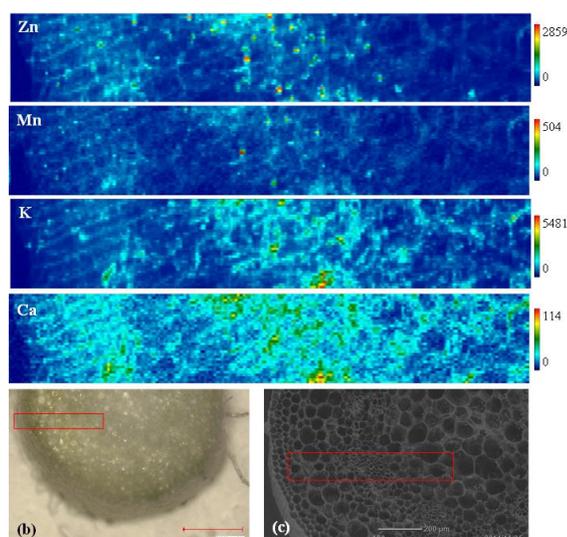


Fig. 1: μ -XRF imaging of *G. pseudochina* treated with Zn (100 mg L⁻¹). (a) show the XRF mapping of Zn, Mn, K and Ca. (b) and (c) are photograph and SEM image of the stem.

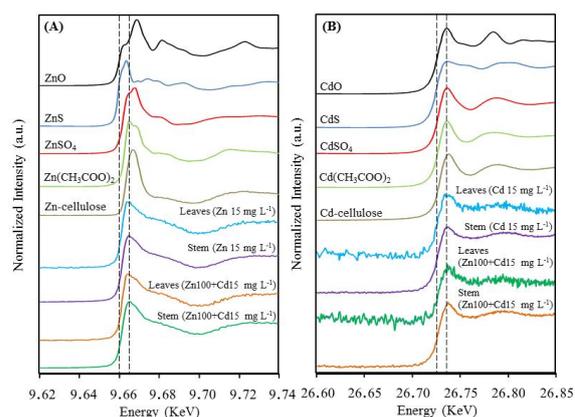


Fig. 2: Zn K edge (A) and Cd K-edge (B) XANES spectra of *G. pseudochina* treated with Zn (100 mg L⁻¹), Cd (15 mg L⁻¹), and Zn plus Cd (100 mg L⁻¹+15 mg L⁻¹).

3. Result and Discussion

The μ -XRF imaging showed the distributions of K, Mn, Ca and Zn within the samples (Fig.1). The distributions of Zn and Cd in the stem and leaves were similar area in the epidermal cell and vascular tissue. The bulk plant samples treated with Zn and/or Cd were measured for XANES spectra (Fig.2). The Zn K edge and Cd K edge XANES spectra and XANES fitting implied that Zn²⁺ and Cd²⁺ were coordinated with oxygen and sulphur.

References

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Acknowledgement

We express gratitude to the Photon Factory (PF) for research facilities at beamline 4A, 12C, and NW10A (Proposal number 2014G716) and are grateful to Prof. Dr. Izumi NAKAI for the μ -XRF analysis at beamline BL37XU and sincerely thank S. Mitsuo, S. Takada, Y. Yoshii, and W. Yamaoka for helping with the μ -XRF and μ -XANES analyses.

Research Achievements

Mongkhonsin, B., Nakbanpote, W., Hokura, A., Nuengchamngong, N., Maneechai, S. (2016). Phenolic compounds responding to zinc and/or cadmium treatments in *Gynura pseudochina* (L.) DC. extracts and biomass. *Plant Physiology and Biochemistry*. 109, 549-560.

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