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 µm) 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.

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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Research Achievements


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