

Concentration of elements in xylem fluid of arsenic stressed barley seedlings grown hydroponically

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Abstract

The inorganic solutes of the xylem fluid of Arsenic (As) stressed barley (*Hordeum vulgare* L. cv. Minorimugi) seedlings were elucidated. The plants treated with 0, 6.7, 33.5, and 67 μM As were grown in culture solution in a greenhouse under natural condition. The plants showed chlorosis symptoms at the highest As treatments at 14 days after treatments. The plants were harvested at 14 days after As treatment. The mineral concentration of the shoot and root were measured by atomic absorption spectrometry after being dried and digested by nitric-perchloric acid. Phosphate concentration of the plant materials were measured by ammonium vanadomolybdate method. The xylem fluids were collected from the cut surface of the stunts of the plants treated by As. The flow rate, concentration, and translocation of nutrient elements of xylem fluid were studied. Different volume flux rates were imposed by changing the concentration of As in the nutrient solutions. The concentration of elements was measured by PIXE in Nishina Memorial Cyclotron Center of Japan Radioisotope Association. Usually, As toxicity reduced the flow rate of xylem fluid of barley plants. Under As toxicity, the concentration of P, Fe, Mn, Zn, and Cu increased, while Ca concentration decreased in xylem fluid of barley at the 67 μM As treatment in the nutrient solution. Arsenic concentration increased but translocation decreased at the highest As treatment. In our experiment, we suggest that As may induce Fe deficiency in barley. However, more investigation is necessary for the conclusion. Furthermore, physiological mechanism for As to reduce Fe translocation needs to be investigated.