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Author: Yazhou Chen Shengli Wang Zhongren Nan Jianmin Ma Fei Zang Yepu Li Qian Zhang

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Effect of fluoride and cadmium stress on the uptake and translocation of fluoride and cadmium and other mineral nutrition elements in radish in single element or co-taminated sierozem

Yazhou Chen [a, b], Shengli Wang [a, b] *, Zhongren Nan [a, b], Jianmin Ma [a, b], Fei Zang [a, b], Yepu Li [a, b], Qian Zhang [a, b]

[a] Key Laboratory for Environmental Pollution Prediction and Control, Gansu Province, College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000, China
[b] Key Laboratory of Western China's Environmental Systems (Ministry of Education), College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000, China

* Corresponding author at: College of Earth and Environmental Sciences, Lanzhou University, Tianshui South Road 222, Lanzhou 730000, Gansu, China.
E-mail address: wangshengl@lzu.edu.cn (Shengli Wang)

Highlights

The F-Cd treatments showed synergistic effect (negative) on growth of radish.
F or Cd was mainly accumulated in the leaves of radish.
F or Cd was liable to transport to tops of radish.
The addition of F-Cd inhibited Cu uptake by the roots.
The addition of F or Cd or F-Cd all promoted Zn absorption by radish.

Abstract

The radish plants are cold- and drought-tolerant crops. They have been widely planted in semi-arid or arid areas of northwest China. With high biomass production, the radish plants have been proved to be a potential phytoaccumulator of several metals (Cu, Pb, Zn). A pot experiment with single element-contaminated or co-contaminated soils was conducted to study fluoride (F) and cadmium (Cd) accumulation in radish plants and the effect of their interaction on radish growth. After four months growing in sierozem, F and Cd with different concentration levels were added to the soil. The dry biomass and the concentrations of F and Cd in the roots and leaves of radish plants were measured, and the bioaccumulation and translocation factors of F and Cd were calculated. We also identified the contents of Cu, Zn and Mn in radish plants. The combined contamination of F and Cd showed synergistic effect (negative) on the growth of radish plants. It was found that F or Cd was mainly accumulated in the leaves of radish plants which were able to transport to tops of radish plants. The addition of F-Cd inhibited Cu uptake by the roots, while the addition of F or Cd or F-Cd all promoted Zn absorption by radish plants. Results also showed that the synergistic interaction (positive) between F and Cd played a role in the absorption of Mn by the roots of radish plants.

Key words: Radish, Fluoride, Cadmium, Accumulation, Translocation, Interaction

1. Introduction

Fluoride (F) can be identified widespread in the natural environment, including water, soil and plants. However, high F due to irrigation and industrial activities may result in human health problems. It poses serious risks to human health and agriculture. F intake in humans mainly comes from drinking water and food materials (Singh et al., 1993). Vegetations can incorporate and