Cu Distribution, Root Exudates in Rhizosphere Soils and Their Effects on Cu Accumulation in the Cu-tolerant plant: Castor Bean (*Ricinus Communis* L.)

GUOYONG HUANG *, HONGQING HU

[1] College of Resource and Environment, Huazhong Agricultural University, Wuhan 430070, P.R.China
* corresponding E-mail: hgy_027@163.com;

Background and aims: Castor bean (*Ricinus communis* L.) is a fast-growing plant, and it has a well-developed root system, high tolerance to poor soil fertility and high economic value. Due to these distinct advantages, castor bean has attracted the attention of some phytoremediation workers. However, the interaction of the root exudate of castor bean and Cu in the rhizosphere is unclear. This study aimed to determine the effects of root exudate of castor bean on the distribution of Cu in rhizosphere soil and accumulation of Cu by castor bean.

Methods: A pot experiment with castor bean was conducted in the artificial copper contaminated soil under the greenhouse condition. After being transferred into the soil for one month, the plants were harvested, and total plant biomass and the Cu accumulations in plants were measured. The total amount and the speciation of Cu, total nitrogen and carbon, and the compositions of root exudate (i.e., organic acids and amino acids) in the rhizosphere and non-rhizosphere soil were also determined.

Results and conclusion: There were continuous changes in Cu fractionation within the castor bean rhizosphere soil. The accumulation of Cu in the castor bean plant was found to be biomass-dependent. The amount of accumulated Cu in the plant material exceeded the initial quantity of the exchangeable Cu in the soil, revealing a transformation from less bioavailable to more bioavailable fractions. During the cultivation, the decreases in pH and increase in dissolved total carbon (TC) in the castor bean rhizosphere soil were observed. The rhizosphere soil pH was significantly negative with the total organic acids (R = -0.97, $P \leqslant 0.05$) and total amino acids (R = -0.94, $P \leqslant 0.05$) in root exudate, respectively. The change in Cu speciation may result from root-induced changes in low molecular weight organic acids and amino acids in the rhizosphere. The acid exchangeable Cu was significantly positively correlated with the oxalic acid (R = 0.98, $P \leqslant 0.05$) and total organic acid in rhizosphere soil (R = 0.97, $P \leqslant 0.05$), respectively. The study suggests that castor bean accumulated most Cu in its root and the organic acids and amino acids from the root exudate influence the chemical morphology and biological effectiveness of Cu in the rhizosphere soil.

Keywords: Castor bean; Root exudate; Copper; BCR Sequential extraction; Rhizosphere;