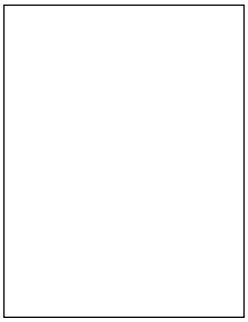
Accepted Manuscript



Title: Effects of Silicon on the Growth, Physiology and Cadmium Translocation of Tobacco (*Nicotiana tabacum* L.) in Cadmium Contaminated Soil

Author: LU Yin-Gang, MA Jun, TENG Yin, HE Jun-Yu, Peter Christie, ZHU Ling-Jia, REN Wen-Jie, ZHANG Man-Yun and DENG Shi-Ping

PII: S1002-0160(17)60417-X
DOI: 10.1016/S1002-0160(17)60417-X
Reference: NA

To appear in:

Received date: NA
Revised date: NA
Accepted date: NA

Please cite this article as: LU Yin-Gang, MA Jun, TENG Yin, HE Jun-Yu, Peter Christie, ZHU Ling-Jia, REN Wen-Jie, ZHANG Man-Yun and DENG Shi-Ping, Effects of Silicon on the Growth, Physiology and Cadmium Translocation of Tobacco (*Nicotiana tabacum* L.) in Cadmium Contaminated Soil, *Pedosphere* (2017), 10.1016/S1002-0160(17)60417-X.

PEDOSPHERE
Pedosphere ISSN 1002-0160/CN 32-1315/P doi:10.1016/S1002-0160(17)60417-X

Effects of Silicon on the Growth, Physiology and Cadmium Translocation of Tobacco (*Nicotiana tabacum* L.) in Cadmium Contaminated Soil

LU Yin-Gang[1,*], MA Jun[1,2,3], TENG Yin[2], HE Jun-Yu[1], Peter Christie[2], ZHU Ling-Jia[2], REN Wen-Jie[2], ZHANG Man-Yun[2] and DENG Shi-Ping[4]

[1] *College of Agriculture, Guizhou University, Guiyang, 550025 (China)*
[2] *Key Laboratory of Soil Environment and Pollution Remediation, Institute of Soil Science, Chinese Academy of Sciences, Nanjing, 210008 (China)*
[3] *College of materials and Chemistry, Tongren University, Tongren, 554300 (China)*
[4]*Department of Plant and Soil Sciences, Oklahoma State University, Stillwater OK, 74078 (USA)*
[*]Corresponding author. E-mail: agr.yglu@gzu.edu.cn.

ABSTRACT

Pot experiments were performed to study the role of silicon (Si) in alleviating cadmium (Cd) toxicity in tobacco plants. Nine treatments consisting of three concentrations of Cd (0, 1 and 5 mg kg^{-1}) together with three Si levels (0, 1 and 4 g kg^{-1}) were investigated. One hundred days after transplanting tobacco seedlings, plant growth parameters, biomass, and concentrations of Cd, malondialdehyde (MDA), chlorophyll and carotenoids were determined. Application of exogenous Si enhanced the growth of tobacco plants under Cd stress. When 5 mg kg^{-1} Cd was added, Si supply increased root, stem and leaf biomass by 26.1-43.3, 33.7-43.8 and 50.8-69.9%, respectively, compared to the zero-Si treatment. With Si supply the transfer factor of Cd in tobacco from root to shoot under both 1 and 5 mg kg^{-1} Cd treatment decreased by 21% compared to zero-Si treatment. The MDA contents in Si-treated tobacco plants declined by 5.5-17.1% compared to zero-Si treatment, indicating a higher Cd tolerance. Silicon application also increased the chlorophyll and carotenoid contents by 33.9-41% and 25.8-47.3% compared to the Cd only treatment. It is concluded that Si application can alleviate Cd toxicity to tobacco by decreasing Cd partitioning in the shoots and MDA levels and by increasing the contents of chlorophyll and carotenoids, thereby contributing to lowering the potential risks of Cd contamination.

Key Words: cadmium, chlorophyll, growth, silicon, tobacco, translocation.