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Factors affecting cadmium absorbed by pistachio kernel in calcareous soils, southeast of Iran

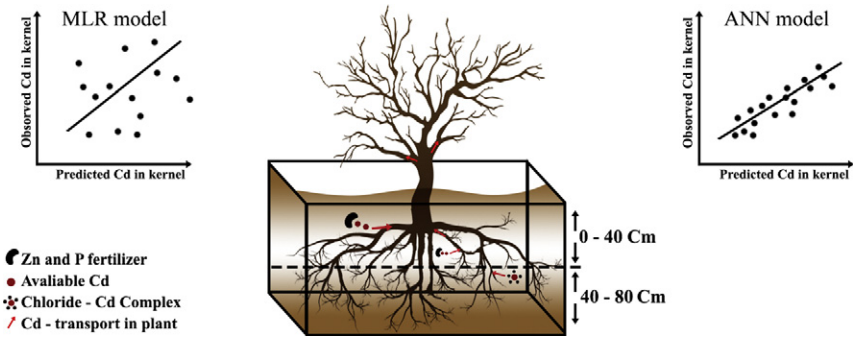
H. Shirani [a,*], S.J. Hosseinifard [b], H. Hashemipour [c]

[a] Department of Soil science, College of Agriculture, Shahrekord University and Vali-e-Asr University of Rafsanjan, Iran
[b] Pistachio Research Center, Horticultural Sciences Research Institute, Agriculture Research Education and Extension Organization (AREEO), Rafsanjan, Iran
[c] Department of Soil Science, College of Agriculture, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran

HIGHLIGHTS

- Soil available P, Zn and soil salinity were the most important factors affecting cadmium absorption in pistachio kernel.
- Modeling of Cd absorption by pistachio kernel using ANN model was more accurate compared to stepwise regression model.
- Cd-DTPA is not probably an appropriate indicator for determining plant available Cd in Saline-calcareous soils.
- Soil salinity in studied regions can increase the solubility and absorption of cadmium.

GRAPHICAL ABSTRACT



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ABSTRACT

Cadmium (Cd) which does not have a biological role is one of the most toxic heavy metals for organisms. This metal enters environment through industrial processes and fertilizers. The main objective of this study was to determine the relationships between absorbed Cd by pistachio kernel and some of soil physical and chemical characteristics using modeling by stepwise regression and Artificial Neural Network (ANN), in calcareous soils in Rafsanjan region, southeast of Iran. For these purposes, 220 pistachio orchards were selected, and soil samples were taken from two depths of 0–40 and 40–80 cm. Besides, fruit and leaf samples from branches with and without fruit were taken in each sampling point. The results showed that affecting factors on absorbed Cd by pistachio kernel which were obtained by regression method (pH and clay percent) were not interpretable, and considering unsuitable vales of determinant coefficient (R^2) and Root Mean Squares Error (RMSE), the model did not have sufficient validity. However, ANN modeling was highly accurate and reliable. Based on its results, soil available P and Zn and soil salinity were the most important factors affecting the concentration of Cd in pistachio kernel in pistachio growing areas of Rafsanjan.

1. Introduction

Heavy metal is a metal whose bulk density is >5.5 g cm^{-3}. Heavy metals are stable, non-degradable and toxic in high concentration (Kim et al., 2009). Among heavy metals, cadmium (Cd) has special importance due to long half-life in human and animal body and high toxicity. So this element has a role in liver, lung, bone, blood circulation, heart, kidney and

* Corresponding author at: Department of Soil Science, College of Agriculture, Shahrekord University and Vali-e-Asr University of Rafsanjan, 7718897111, Iran.
E-mail addresses: shirani@vru.ac.ir (H. Shirani), hosseinifard@pri.ir (S.J. Hosseinifard).

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