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APPLICATION OF ARTIFICIAL NEURAL NETWORKS TO ESTIMATE THE CONCENTRATION OF ABSORBED CADMIUM BY AN IRANIAN WHEAT CULTIVAR

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INTRODUCTION: Evaluation of metal accumulation in soils and plants is of environmental importance due to their health effects on humans and other biota (1). Heavy metals stress in soils results in subtle changes in leaf chlorophyll concentration, which are related to crop growth and crop yield (2). The concentration of chlorophyll a is a sensitive index under cadmium stress. Accurate estimation of the absorbed cadmium by a crop under cadmium stress is the essential test for food security (3). The aim of this paper is to create a back propagation (BP) neural network model to estimate cadmium concentration in wheat under cadmium stress.

MATERIALS AND METHODS: A factorial experiment in completely randomized designed and performed with three replications in the research greenhouse in Tehran University, Collage of Agriculture and Natural Resources. We planted a cultivar of wheat (Azadi) under three different level of cadmium concentration, including: 25, 50 and 100 mg Cd/Kg soil. After 30 days content of absorbed cadmium and concentration of chlorophyll a were determined. Then we designed a model of ANN to estimate the concentration of absorbed cadmium based on chlorophyll a, as a parameter that we can easily and quickly measure it.

RESULTS AND DISCUSSION: The results showed that a neural network prediction model with 11 neurons in hidden layer and Levenberg-Marquardt backpropagation as network training function had highest correlation coefficient (R^2 = 0.91175) between the measured concentration of chlorophyll a and predicted concentration of absorbed cadmium by wheat and the mean square error (MSE) was 2.67. This finding agrees with the results of Liu *et al* (2010).

Keywords: Artificial neural network, Cadmium, chlorophyll a.

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