Influence of cadmium toxicity on nitrogen and phosphorus uptake and some vegetative growth parameters in shoot of seven rice cultivars

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Abstract

Cadmium (Cd) is one of the toxic heavy metals which can be absorbed by plants and have detrimental effects on plant growth and nutrients uptake. In order to investigate the effect of Cd on some vegetative growth parameters, nitrogen (N), phosphorus (P) and Cd uptake in aerial parts of seven rice cultivars, a pot experiment with three soil-applied Cd levels (0, 45, and 90 mg Cd/kg soil) and seven rice cultivars (Ghasrodashti, Khazar, Anbarboo, Dasht, Hassani, Taroom and Kadoos) was conducted in a completely randomized design with three replications. Results revealed that Cd addition to soil had negative effect on some growth parameters, so that application of 90 mg Cd/kg soil decreased mean relative growth (RGR), wet and dry weights, shoot height, and number of lateral, main, and total tillers of seven rice cultivars by 64.7, 65.8, 65.6, 35.4, 13.3, 88 and 40% as compared to those of control, respectively. Hassani and Ghasrodashti cultivars had the highest shoot wet and dry weights, height, and RGR, and Khazar and Tarom cultivars had the lowest ones, compared to other cultivars. Addition of Cd to soil significantly increased shoot Cd uptake, but decreased shoot N and P uptake, as compared to those of control. Hassani and Khazar cultivars had the highest and lowest N and P uptake, respectively. Our tentative conclusion is that Hasani cultivar was superior cultivar compared to other studied cultivars due to its greater performance. Therefore, Hassani and Khazar cultivars could be considered as tolerant and sensitive cultivars, respectively, to Cd toxicity.

Keywords: Rice cultivars, Vegetative growth, Nutrients, Cadmium toxicity.

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